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Importance of product distribution to the electrical industry — pg. 24

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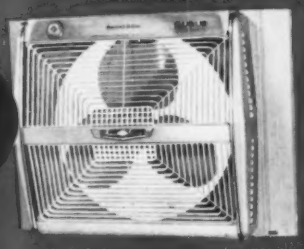
Air Berns King



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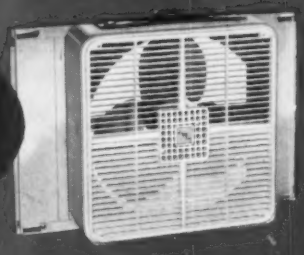

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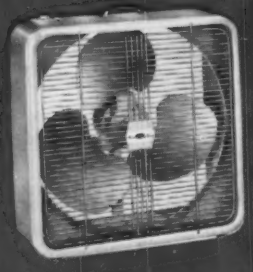

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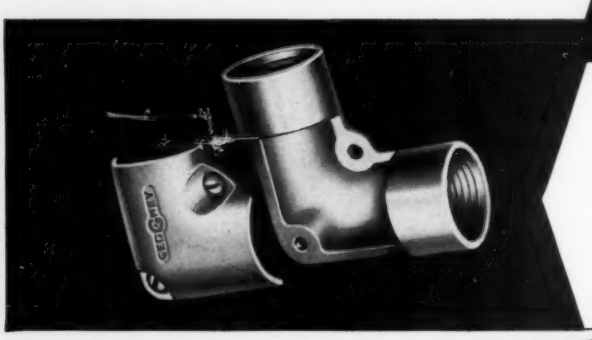

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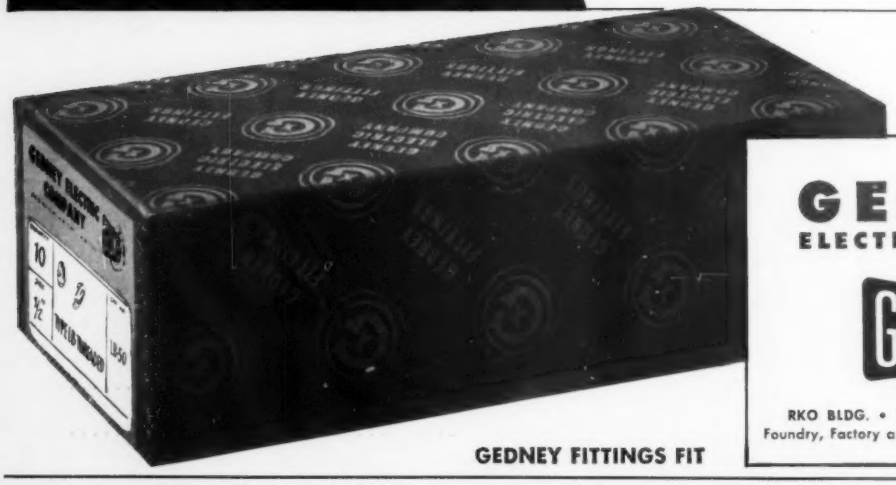

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Volume 37 **Number 1**

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Economic comment

by J. Whitney Bunting, Ph.D.
Contributing Economics Editor

Tight money—potential economic threat

Those who follow economic and business barometers have been arguing the pro and con of economic policy that has restricted the availability of money for business and consumer purposes. Certainly the fact is quite clear that without a reasonable supply of liquid cash available, one can expect that the national economic machine could easily grind to a stop (or in fact, might spin into reverse and force a cutback in economic activity.)

Thus there is adequate reason to thoroughly review the policies and programs that have engineered the current scarcity of money on the market today. The last few years of unprecedented economic and business advance, coupled with a strong surge of consumer confidence and spending, have created a "boom" atmosphere that might well lead into economic pitfalls if not adequately policed.

A major part of the problem has been Government and Federal Reserve Bank policy. These are two entirely separate operations; yet when both are moving toward the same economic goals, they do promote an economic control over our lives that cannot be avoided. Policy today is one of a controlled inflationary nature. By this vague wording, it is indicated that popular approval has been given to certain inflationary results that should therefore be maintained.

For example, even though high prices and consequent increases in the cost of living are still unpopular, the simple fact that income has risen as well puts an entirely different light upon public acceptance of this inflationary condition. In essence, inflation as a term may not be thoroughly acceptable; yet the basic characteristics of an inflationary period (high wages, full employment, variety of available merchandise, etc.) are very popular.

In times past, a period of inflation could easily develop a momentum that soon carried a national economic system into a veritable chaos. Depressions and panics were born during periods of unwise and uncontrolled business expansion generated by a psychology of inflation.

Thus, those persons who have been charged with the responsibility to maintain economic stability in this nation have had to accept some facets of inflation; yet they are also forced, by virtue of their obligations, to prevent the run-away aspects that can be so devastating to an economic structure.

Applying "brakes"

For this reason (and some others as well), it has been necessary to apply certain "brakes" that will prevent an inflationary spiral. One basic method is to curtail the availability of money and to make it harder for businessman and consumer alike to obtain. Certain individuals and companies are hurt by this policy, and some ventures must fail because of money scarcity.

However, the values of a controlled inflation are so great (particularly when compared with the lessons of the past) that little fault can be found with the "tight money policy." With continuing pressures of an inflationary nature, continued tightness of the money market can be anticipated unless and until Government and banking policy makers feel that some incentive for further economic improvement is necessary.

In spite of the fact that such controls over money supply are certainly in the general public interest, it is also true that they are frequently misinterpreted and thus can be unpopular when all facts are not known. It is for this reason that sound statements of money and credit policy should be issued periodically by the controlling authorities to prevent misleading statements. Like any other issue that affects the well-being of many citizens, money control can easily become a political football. This should not be, although one can easily recognize that economic welfare and the methods to be used to promote such welfare are both a public and political concern.

Congressional interest

Recent efforts of the Democratic members of Congress indicate that they will take strong steps to insure that they receive full and adequate data of the actions of the Federal Reserve Board and the reasons for such actions. Since so much of the recent presidential campaign centered around economic matters, Democratic leaders believe that it is to their interest (as well as that of their partisan supporters) to follow very closely the banking controls.

Although the Federal Reserve Board is uncontrolled by the Government and although their actions are non-political in nature, future political statements may classify Federal Reserve policy as controlled by the Administration, even though this is not true.

Opposition to strong money controls may come from several important segments of American business too. Construction, now lagging 15 per cent behind last year, will certainly ask for money and credit improvement to the end that it may reclaim its lost activity. Large corporations, faced with the high cost of borrowing, may also join the protesting group.

Dr. Bunting is a well-known economist and educator having special knowledge of the South.

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THE EYES OF TEXAS!

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Contact your nearest Rome Cable representative for further information —or write to Department 344 and ask for Bulletin UF-1. Rome Cable Corporation, Rome, New York.

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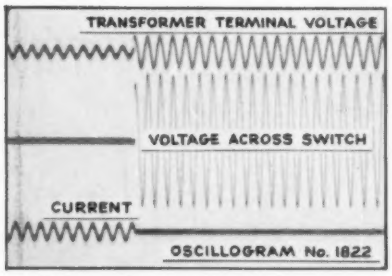
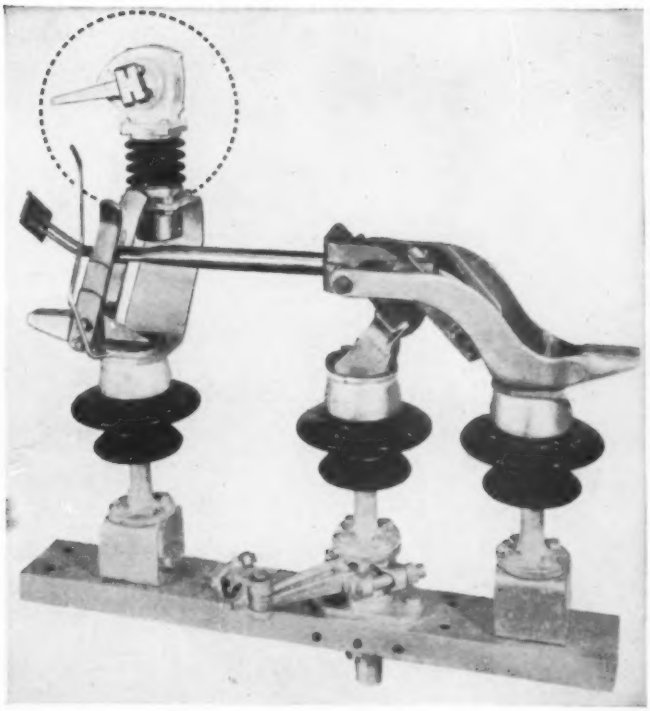
Powerupter installed on Delta-Star MK-40 Switch—is actuated by switch blade movement, providing instant circuit interruption without external arc or flame.



Typical oscillogram made during interrupting test of Delta-Star's Powerupter at 15 kv.



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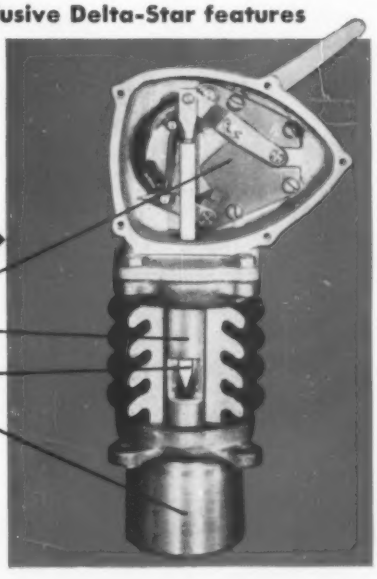
DELTA-STAR'S New *Powerupter* Switch!

Voltage ratings from 7.5 kv through 34.5 kv—built with exclusive Delta-Star features

This new Delta-Star Powerupter combines a new interrupting device with the most modern disconnecting switches—for interrupting load, magnetizing and charging currents.

The Powerupter features heavy duty construction throughout. Its exclusive automatic trip mechanism provides instant breaking and making speeds independent of switch operation. No feature of Delta-Star switches is sacrificed—every characteristic is retained.

Cutaway view shows *Powerupter* operating advantages



Powerful, high speed mechanism controls speed of Powerupter's operation independently of main switch operating time.

Arcing chamber lined with gas-evolving material. Chamber contains stationary contact and moving contact.

Follower of gas-evolving material confines arc—insuring rapid arc extinction at low current values.

Exhaust chamber provided with muffler—confines and cools exhaust gases released from interrupting chamber.

Ratings: Voltages, 7.5 kv through 34.5 kv; interrupting capacity 600 amp. Continuous current ratings, 400, 600, 1200, 2000 amps.

For all the facts, write Delta-Star or ask your nearby representative. Delta-Star Electric Division, H. K. Porter Company, Inc., 2437 Fulton St., Chicago 12, Ill. District offices in principal cities.

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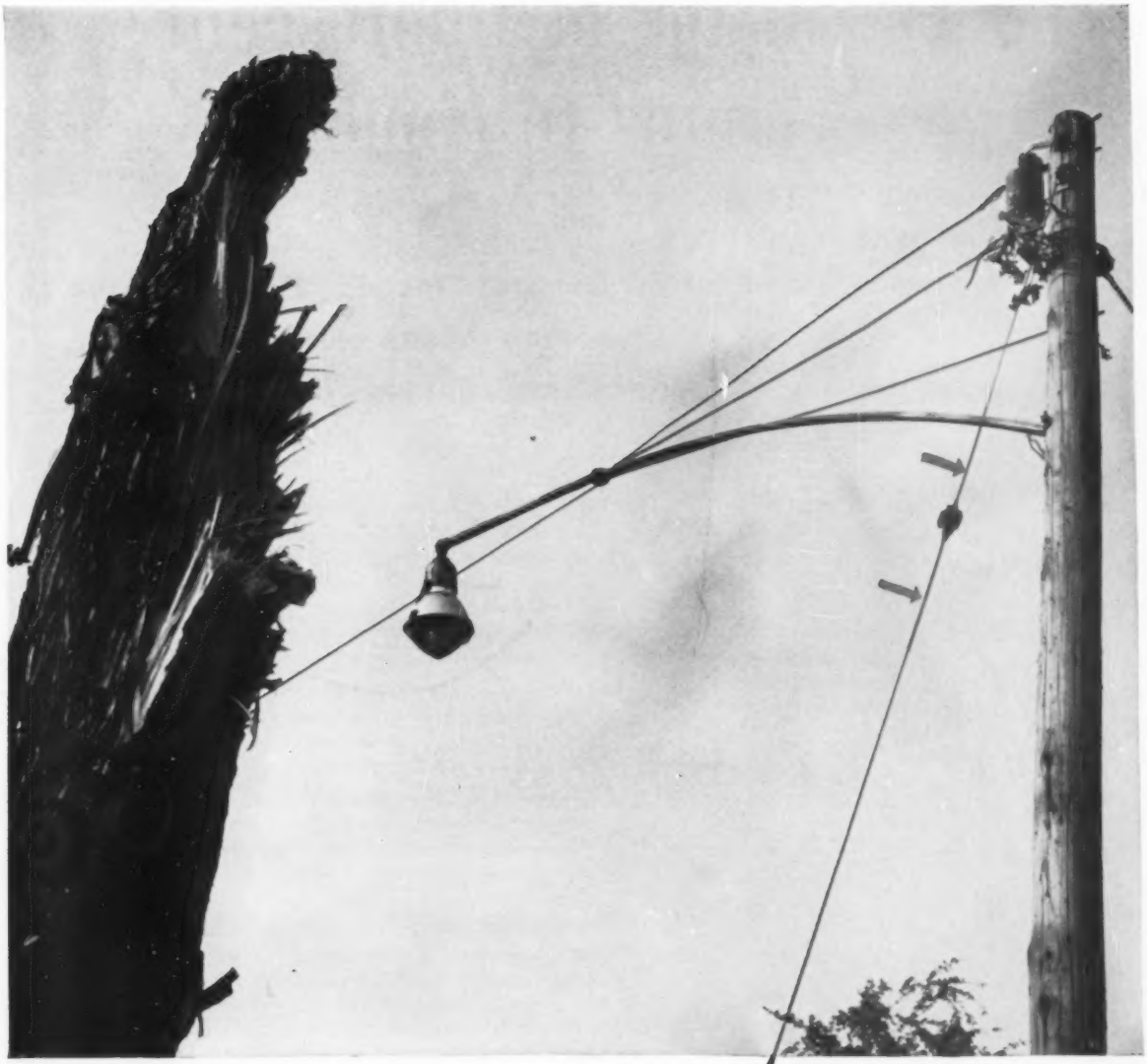

75 - 100 MPH Wind Rips off Tree

PLP *GUY-GRIP* Dead-Ends Stand Firm

Nature provided the test. Hurricane-strength winds—75-100 miles an hour—snapped off the top half of a huge elm tree ... and hurled it against both pole and guy. After the debris was removed ... the picture told its own dramatic story. Here's graphic evidence that today's best answer to any guying problem ... subjected to any kind of condition ... is PLP Guy-Grip dead-ends.

Made in accordance with or for use under U. S. Patent No. 2,761,273; other patents pending.

PX – 77

PREFORMED LINE PRODUCTS COMPANY

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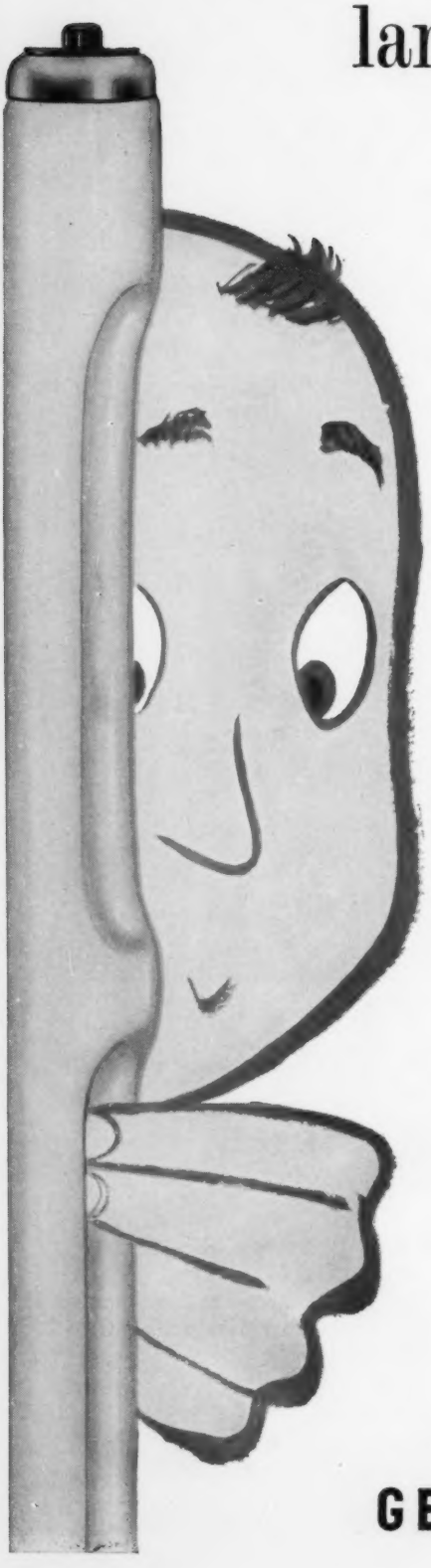
TELEPHONE: CLEVELAND EXPRESS 1-3571

The shape of fluorescent lamps to come



New General Electric "Power-Groove" discovery means more light for you . . . at less cost

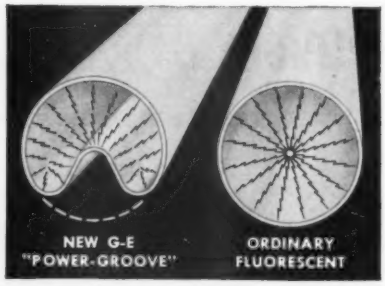
Look at this new kind of fluorescent lamp. It's the General Electric "Power-Groove"—a revolutionary new development created by G-E engineers. It not only gives more than 2½ times as much light as the 8-foot slimline (most widely used 8-foot fluorescent), and lets you save more than 20% on your initial cost, and has fewer parts to maintain . . . but it even *looks* different—for a reason.

It's the grooves in General Electric "Power-Groove" Lamps that make possible a greater increase in light-per-foot than all the combined increases made since General Electric introduced fluorescents in 1938!

The new G-E "Power-Groove" Lamps are the popular 8-foot length (200-watts) with 4-foot sizes also available and 6-foot sizes later. They are Rapid Start lamps that need no starters — and are to be used in fixtures and circuits designed especially for them.

IF YOU'RE PLANNING a new lighting installation—you'll want to investigate G-E "Power-Groove". New G-E "Power-Groove" lamps are going into some installations right now! You'll be able to buy them . . . and the fixtures . . . in quantity by midsummer, so get the whole story now. Call your local G-E Lamp Supplier or write: General Electric Co., Large Lamp Dept., Nela Park, Cleveland 12, Ohio.

COMPARE! The new G-E "Power-Groove" construction (left) works 3 ways to give more light. One: it places some of the light-producing phosphors closer to the energizing area in the center of the lamp. Two: it presents a greater surface area which permits the generation of more ultraviolet rays to activate the phosphor. And three: it makes the lamp run cooler—which permits a higher current design and gives you more light per watt.



Progress Is Our Most Important Product

GENERAL ELECTRIC

"I chose the THERMADOR"

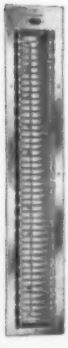
"Seven Leagues Ahead" in the science of bilt-in and portable electric heating

Thermador Electric Heaters *are safe, quiet, dependable.*

MODEL MHF does double duty—heats when needed, but with heating element turned off, the noiseless fan completely circulates air at high speed. Easily carried anywhere. Heavy duty cord and plug. Automatic reset overheat switch. Available in manual or thermostat models. 3000 to 4600 watts, 240 volts. In rich, marbelized bronze finish.

MODEL HF also has two-fold use—warmth in winter, cool air circulation in summer. It's a potent, powerful, fully automatic model, the original fan-type heater. Available in manual or thermostat models. Enclosed sides and safety grille make it completely safe for any room—no danger to children. Convenient finger-lift handle, solid chrome plated rod base. Sienna Brown or White Baked Enamel finish.

MODEL W—durable steel construction. Heats in winter, cools in summer. Almost any wall can be utilized for installation. Separate switches for fan or heat. Heavy duty single phase induction motor, free of television and radio interference. Newly designed 25 amp bilt-in thermostat is sensitive and accurate, assures uniform temperature. Sun Bronze, baked enamel finish—from 2500 to 4500 watts, 240 volts, **MODEL B** (stainless steel, bronze or white)—1650 watts, 120-240 volts.



For head to heels comfort **MODEL LR** Radiant Heater can't be equalled. This is the most popular bathroom wall heater in America. Low cost, installed quickly and inexpensively, built for years of dependable service. **MODEL RB** designed for smaller bathrooms and dressing rooms. Life-time stainless steel finish. RB uses 120-240 volts, 1000 to 1500 watts. LR—120-240 volts, 1650 to 2000 watts.

MODEL LP Longfella gives quick, safe, instant heat for homes, offices and stores. Lightweight, easy to carry. Head to heels design provides overall comfort with a minimum of floor space—truly the heater of a thousand uses. Lustrous hammertone Sun Bronze baked enamel finish.

Here's the end result—the final customer choice of brand. And that's where **THERMADOR** means profits for you! **THERMADOR** electric bilt-in and portable heaters give customers the widest choice of models whether the need is for large rooms or small areas. Just a flick of the switch delivers instant, clean, safe, odorless warmth. Scientifically designed heating element, fan and louvers direct the heat toward the floor. From there it rises, warming the "Living Zone"... quickly, safely, economically. Manual and thermostat models, the fastest heaters made. Ideal for any room in the house, office, shop or factory.

THERMADOR Electrical Manufacturing Co.

A Division of Norris-Thermador Corporation

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Manufacturers of Bilt-in Electric Ranges, Bilt-in Electric Refrigerator-Freezer, Evaporative Coolers, Ventilating Fans

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January, 1957

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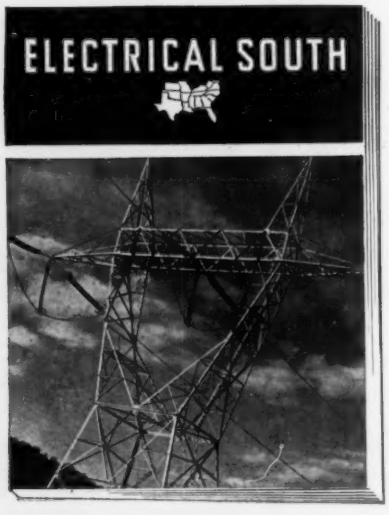

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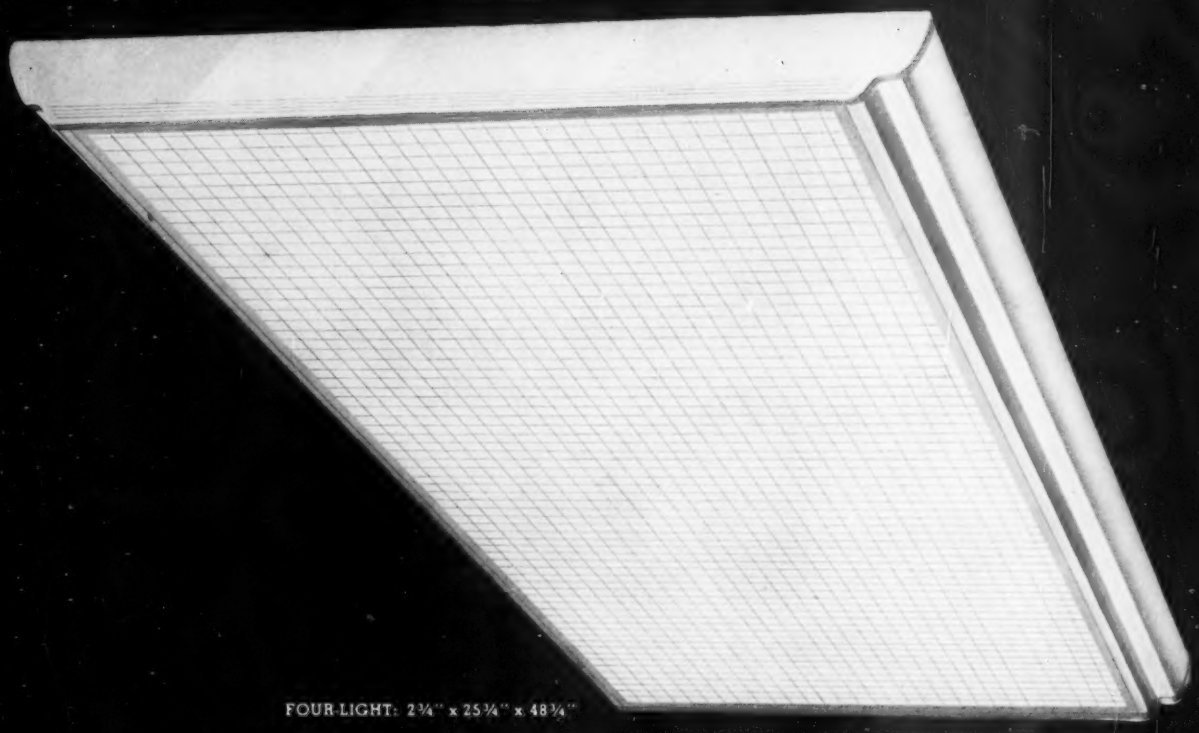
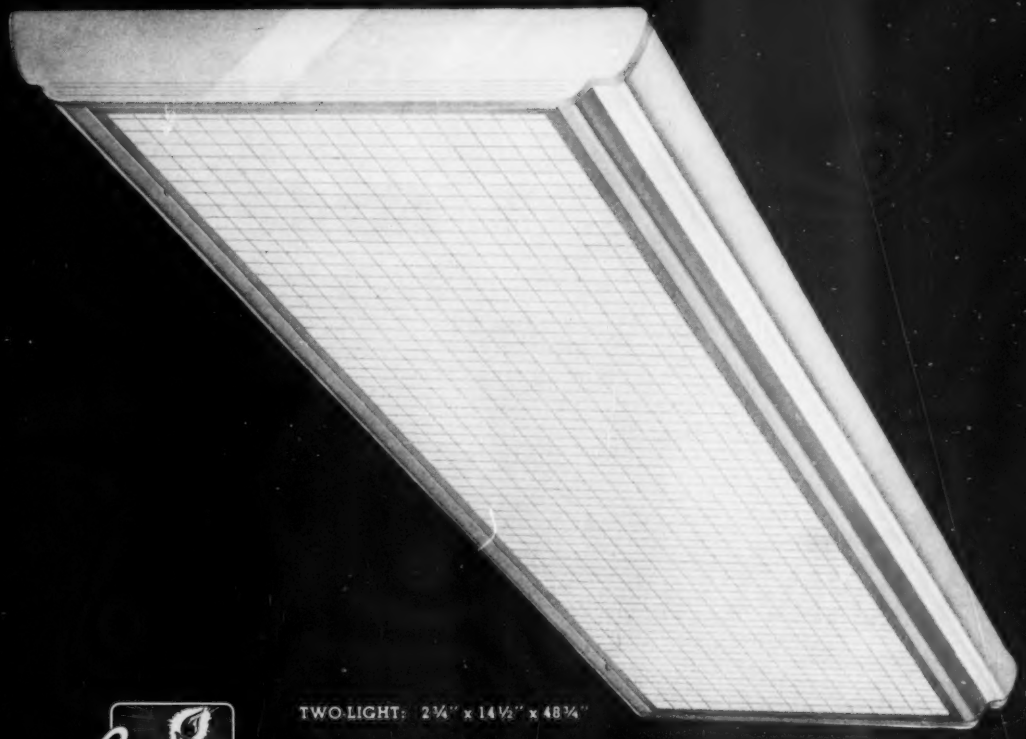


FOUR-LIGHT: 2¾" x 25¾" x 48¾"



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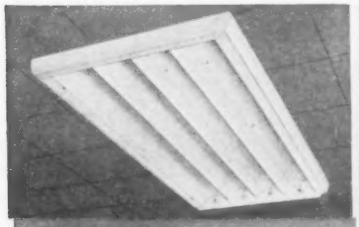
Gibson LIGHTING

GIBSON MANUFACTURING COMPANY

the new Gibson Ceilo • 35

ONLY 2¾" DEEP – AND NO DARK AREAS!

In this striking new fixture, Gibson designers have achieved maximum thinness, with no dark panels or strips in the diffusing area. Parabolic reflectors and a unique way of mounting the ballasts provide a smooth, unbroken panel of light in a fixture of incomparable quality and beauty.



PARABOLIC REFLECTORS
The parabolic reflectors reflect all light straight down and thus provide an even distribution of light over the entire diffusing area.

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Just a touch of the fingertips to the louver latches allows the louver to swing open for relamping. Snap—and it's back in place.

Write today for complete information about the beautiful new Ceilo-35

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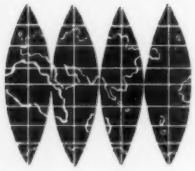

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Controls

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B-725

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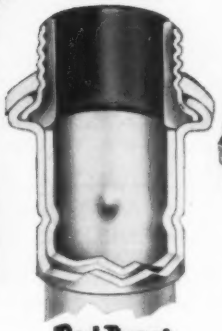

Red Throat
Cross section

"BM" #100
Cutter for ½, ¾ and 1" E.M.T.

"BM" #1000
Holder for ½, ¾ and 1" E.M.T.

"BM" #607
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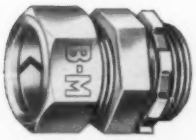
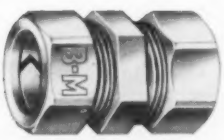
"BM" #600
Changeable Jaw Indenter

Briegel Rain-Tight E.M.T. Compression Fittings

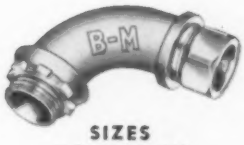


SIZES FROM
½" to 2"



SIZES FROM
½" to 2"

SIZES
½", ¾", 1"



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BRIEGEL METHOD TOOL CO.

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A FULL LINE OF QUALITY GROUNDING DEVICES BY

GUARANTEED F WIRING DEVICES

GROUNDING DEVICES WITH A TERRIFIC "QSP" RATING

QUALITY *tops*

SERVICE *outstanding*

PRICE *lowest*

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RECEPTACLES

2514
PARALLEL SLOT SINGLE RECEPTACLE
3 WIRE GROUNDING
Wide Ears
Double Contacts
15 Amp.—**125** Volts

CAPS

2517
PARALLEL BLADE ARMORED 3-WIRE CAP
Heavy Bakelite—"U" Shaped Blade for Grounding
Cord Hole Diameter .187—.625

2524
TANDEM SLOT SINGLE RECEPTACLE—
3 WIRE GROUNDING
Wide Ears
Double Contacts
15 Amp.—**250** Volts

2527
TANDEM BLADE ARMORED 3-WIRE CAP
Heavy Bakelite—"U" Shaped Blade for Grounding
Cord Hole Diameter .187—.625

2515
PARALLEL SLOT DUPLEX RECEPTACLE
3 WIRE GROUNDING
Wide Ears—Double Contacts
15 Amp.—**125** Volts

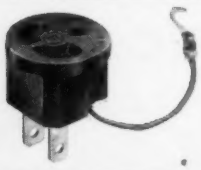
2517B
PARALLEL BLADE 3-WIRE CAP
Heavy Bakelite—"U" Shaped Blade for Grounding
Cord Hole Diameter .437

2525
TANDEM SLOT DUPLEX RECEPTACLE
3 WIRE GROUNDING
Wide Ears—Double Contacts
15 Amp.—**250** Volts

2527B
TANDEM BLADE 3-WIRE CAP
Heavy Bakelite—"U" Shaped Blade for Grounding
Cord Hole Diameter .437

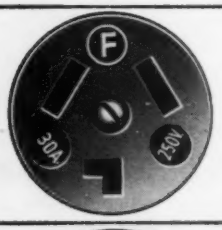
All Items Available in Ivory — And All Receptacles Available on Box Covers

ADAPTER

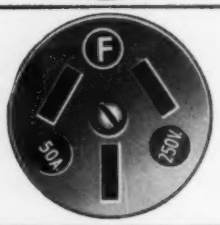


2573-L
3-WIRE BAKELITE GROUNDING ADAPTER
Polarized Slots and "U" Shaped Grounding Slot
3" Green Thermoplastic Grounding Lead.

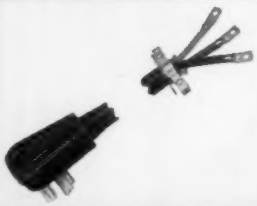
Portable tools or appliances equipped with new type "grounding caps" may be quickly adapted to regular 2-wire outlets with this new adapter.
15 Amp.—**125** Volts



3631
FOR DRYER AND POWER CORDS. 30 AMP. DRYER AND POWER RECEPTACLE
Flush or Surface Mount
Polarized with "L" Shaped Grounding Slot
30 Amp.—**250** Volts



3651
FOR RANGE AND POWER CORDS. RANGE AND POWER RECEPTACLE
Flush or Surface Mount
Heavy Bakelite
with Patented Swing-Away Terminals—Polarized
50 Amp.—**250** Volts



3530
30 AMP. 3-WIRE DRYER AND POWER CORD SET
One Piece Molded Rubber Cap—Includes Cable Clamp
30 Amp.—**250** Volts

CIRCLE F MFG., CO., TRENTON 4, NEW JERSEY

Familiar symbols of safety

FOR YOUR WIRING PROTECTION

Standard-threaded rigid steel conduit is the only wiring system approved today by the National Electrical Code as moisture-, vapor-, dust- and explosion-proof for use in hazardous locations and occupancies.

Permanently safe wiring systems today demand the use of Youngstown Buckeye full-weight rigid steel conduit for positive protection from damaging elements such as water, moisture, vapor, dust and dirt. It's been the accepted standard of architects, contractors and owners who have found over the years its higher quality and longer service life spell increased profits and less trouble on-the-job.

Users across the nation consistently report Buckeye Conduit is easy to fabricate—easy to fish wires through—and guarantees trouble-free installations because of its excellent corrosion resistance.

Leading distributors in every industrial and electrical market are ready to serve you quickly from their ample stocks. They're as near as your phone—why not call now?

Ask your distributor for

Youngstown Buckeye Full

Weight Rigid Steel Conduit

and

Youngstown Electrical

Metallic Tubing.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

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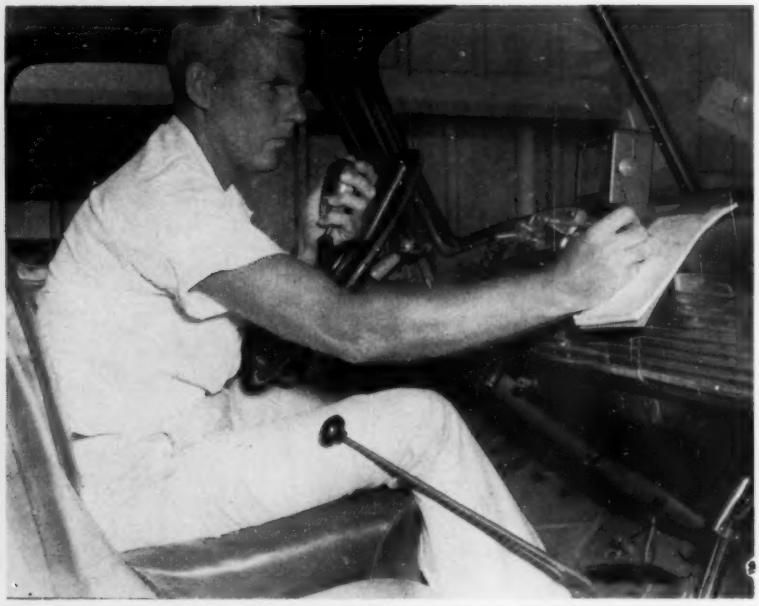
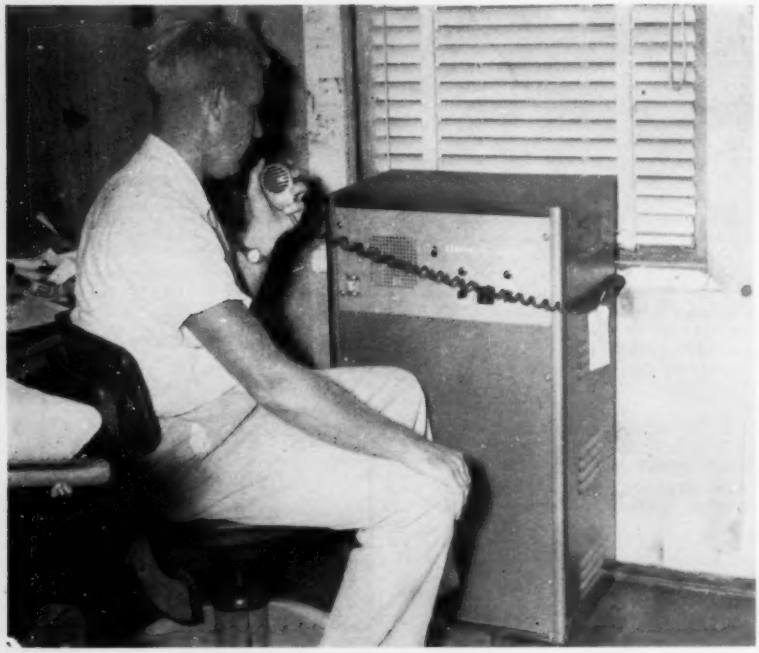
Radio-control system



Walter R. Flournoy, owner of Flournoy Electric Co., Columbus, Ga., notes rendevous time with another two-way radio truck to exchange tools required on special job, thus saving time and mileage.



Mr. Flournoy checks main transmitter unit at office. It cost $3,500 to radio equip two full-time service trucks, emergency panel truck, and station wagon. System paid for itself within a year.

This contractor has proved that two-way mobile radio equipment is economically justifiable for the contracting business that employs only a few men and several trucks. Radio control for two service trucks upped service volume by 400 per cent!

◆ Is TWO-WAY radio communication desirable for the small electrical contractor? Can the contractor with two or three trucks make radio-control pay off? If so, what are the steps required in order to install a control unit in your trucks?

Walker R. Flournoy, owner of Flournoy Electric Co., Columbus, Ga., is emphatic in his praise of radio-control. "When you've only got two full-time service trucks like I do, you have got to keep them moving from one job to another with a minimum time lapse."

Mr. Flournoy realized $2,000 a month gross volume from one service truck prior to installing the radio units. Now Mr. Flournoy has added another truck and upped his monthly service volume to $8,000!

Encourage service business

"We are developing our service business every day," said Mr. Flournoy. "Five years from now the electrical contractor who has been neglecting service in order to make a big volume on contracting alone will wish he had taken the time to encourage the service business from commercial and residential accounts. Right now, I have between 130 and 140 of these accounts, and this number is rising constantly."

To outfit present units, Mr. Flournoy had to install transmitter and receiver units in two trucks especially built for service work, a panel truck, and a station wagon. These units, and a master transmitter and receiver unit installed in the office, cost Mr. Flournoy $3,500 when originally installed.

"I paid cash for this system," said Mr. Flournoy. "That elimi-

boosts service volume

nated interest charges. I plan to depreciate the equipment over a five-year period, and so far this year, I have spent only $50 for maintenance. Part of this maintenance cost was for two semi-annual transmitter frequency checks made by a licensed radio engineer. These inspections are required by the Federal Communications Commission.

Radio control advantages

"There are many more advantages the small electrical contractor can realize by installing a radio-control unit," said Mr. Flournoy. "He can cover five times the ground he formerly covered with the same truck. He can cut his mileage by one-quarter and reduce gasoline and maintenance costs appreciably. He can reduce labor costs, because his expensive repairmen waste less time getting to and from jobs.

"With radio control, a contractor can cover emergency calls quickly. He can cut hours of wasted time and activity off each day's operation, and he can keep a heavy schedule of repair and service business constantly turning with a minimum backlog.

"Here is an example that will clearly illustrate how radio-control increases the effectiveness of a single truck. We sent a truck out to Overlook, a suburb of Columbus, early one morning to answer a home service call. Before we had left that area, the repairman had been to four other jobs within a seven-block area!

"Without radio, that truck could have made five separate trips or after each job, would have had to use a local telephone to check in for additional jobs.

"If our man is at Fort Benning, there are many areas where telephones are restricted. Unable to use local phones, the man would lose many minutes driving to a 'phone.

"Fort Benning is about nine miles from town, and we get a lot of business out there. Once we have a truck in that area, our man can handle any other calls that come in. We get the same price for that job as if we had sent another truck out there. I frankly don't see how a contractor who wants the service trade, can get along without a radio set-up.

The radio log: a record of calls made, time of beginning job, time of completion, and location of truck: is kept by Tommy Meadows, bookkeeper and dispatcher. Through this log, the customer can be given an accurate estimate as to when a serviceman can be on the job.

Log system

"Our radio frequency is assigned by the FCC, and so is our operational procedure. We keep a radio log on which we list the time and every transmission we make. Through this log, we are able to keep up with every truck. We know the time it goes on a job, the time off, and the location.

"Through this log, we are able to give our customers an accurate estimate of when our man can be on a job. Not long ago, an ice cream plant gave us an emergency call. Our log showed both trucks on jobs, and we estimated that it would take between thirty and forty minutes for either of them to complete their work. We advised the account we would be out within an hour. He said fine, but later called another firm who promised him they would be out, 'Right away!'

"Ten minutes after we got our call, one of our men called in for information on the work he was doing. Not being an emergency, we took him off that job briefly and sent him to the ice cream plant. He arrived 15 minutes after the first call went out.

"The other service firm, who promised they would get out right away, got a man to the job 35 minutes after our man had been on the job. Our customer was grateful. He has given us a contract to re-wire his plant, and we credit our control system for the job."

The radio log is also an accurate record of time on and off the jobs. This serves to offset those occasional gripes that come from customers who say they were overcharged for five minutes work. The log usually shows from 30 to 40 minutes on the job.

Advertising appeal

"Radio-control has terrific appeal to customers, and we play up the sudden service idea on our radio and television advertising,"

(Continued on page 112)

Business rise predicted for 1957

The collective opinion of 221 leading economists, as indicated by a survey conducted by F. W. Dodge Corp., construction news and marketing specialists, points to another year of continued business rise in 1957; inflation, too, is expected to increase further.

By George Cline Smith, Vice-President and Economist, F. W. Dodge Corp., New York City.

◆ ACCORDING to the annual survey of leading economists by F. W. Dodge Corporation, 1957 will be the best business year in history, at least in dollar terms. However, inflation will account for much of the rise in dollar indicators of business activity, according to the collective opinion of the 221 economists polled.

Judging from the numerical responses to nine specific questions on economic indicators, as well as from comments offered by most of the economists, three conclusions stand out:

(1) Business activity will set new records in 1957 in dollar terms, but this will be primarily the result of shrinkage in the purchasing power of the dollar, rather than a real increase in output.

(2)The consumer and wholesale price indexes will continue to rise, moderately but definitely.

(3) The rise in prices will be primarily the result of wage increases.

The fact that 1956 is an election year was noted by many of the economists in their comments, but only a handful indicated that they felt the election results might drastically alter the immediate outlook. There was far less discussion of the election in this year's survey than there was in 1954 when only a Congressional election was in the offing.

There was a widespread feeling among many of the economists who had comments to make that the second half of 1957 might see at least a slight decline in business activity, and this also showed up in some of the numerical forecasts of the various indicators. Others felt that there would be a levelling off in the second half. One economist summed up the feeling of many this way: "1957 a banner year. Plateau late in year, but no marked downturn. Election results will make little or no difference."

Whether we should get excited over the common feeling that the second half of 1957 will not continue the upward trend, and might even show a decrease, is a question. Experience with these and other surveys made at this time of year indicates that it is customary for many forecasters to take a somewhat dim view of the second half of the up-coming year, especially if they think the first half is going to be good. In short, there may well be a "second half downward bias" in annual forecasts.

Tight money deplored

Several of the economists, representing a wide range of interests, felt that tight money policies of the government had gone far enough (some felt they had gone too far) and that some easing was in prospect. The range of sentiment is expressed in these two comments: "I believe there is some danger that the Federal Reserve may apply the brakes too hard." "I expect a rise in employment in the early summer which will lead to a de facto acceptance of this round of inflation and easing of credit for further growth of the economy."

The economists participating in the current survey include 27 in financial organizations and insurance companies, 98 from other business firms, 56 from colleges and universities, and 16 from government; the remaining 24 are consultants or members of trade and research organizations.

Details of replies

The economists surveyed were asked to present specific forecasts for the remainder of 1956 and for 1957 for several major economic indicators. A total of 221 economists, the largest number in the history of this annual survey, replied; but a few omitted answers to parts of some questions. There were more than 210 replies to each part of every question except those on construction and housing, and there were more than 200 replies on all parts of these two questions.

Gross national product

The economists in general expect a further steady increase in total dollar output of goods and services, with the most rapid rise in the first half of 1957 and relatively smaller increases in the second half of the year. The median forecast for the end of 1957 is for a seasonally adjusted annual rate of G.N.P. at $420 billion, about three percent above the rate reported for the second quarter of 1956. The economists showed a high degree of unanimity in forecasting an increase in G.N.P. More than 85 percent expected the rate at the end of 1957 to be higher than in mid-1956; and only a very few saw any drop in prospect.

Cost of living

The economists are even more unanimous in expecting a rise in the BLS consumer price index; 90 percent say that the index at the end of 1957 will be above the mid-1956 level. The index stood at 116.2 in June of this year; the median forecast of the economists is 117.5 at the end of 1956, 118 in mid-1957 and 119 at the end of 1957. The great majority of the economists (more than three quarters) thought the index would be 118 or above by the end of next year; a third of the total set the figure at 120 or above. There is a much stronger feeling of rising prices in this year's survey than there was last year.

Wholesale prices

Much the same comments apply to the forecast of wholesale prices. In June the BLS wholesale price index stood at 114. The economists in general expect the

(Continued on page 109)

New method speeds fixture installations

Roll-in busway installation technique allows a run of busway and accompanying fixtures to be hung from one location in half the time ordinarily required. As each length is added on and connected, the unit is pulled on down the line through roller hangers.

◆ A NEW METHOD for simplifying and speeding the installation of busway was announced jointly recently by Frederick J. Somes, Jr., of the Motor City Electric Company, Detroit, Michigan, and Robert C. Wilson, manager-marketing, Distribution Assemblies Department, General Electric Company. With this new method the cost of installation of busway, according to estimates, is reduced by as much as 50 per cent.

Mr. Somes has applied for patent coverage of the new method and its related equipment which he developed. The General Electric Company has obtained rights under these patent applications. These rights entitle General Electric customers to employ this technique and associated equipment when used with G-E busway.

This roll-in method has been used on several major lighting installations using Type LTG Busway as a power supply. On these installations it was determined that the complete systems were installed in approximately one-half the time normally required for hanging fixtures alone.

In these installations, the roll-in technique, which employs a winch and roller-type hangers, allowed four men to hang Type LTG Busway and closely spaced fluorescent fixtures at an average rate of 5 feet per minute. Such speed of installation, according to Mr. Somes, is largely the result of the technique which allows each run of busway and fixtures to be installed simultaneously from one location.

In this new method, Mr. Somes explained, both busway and lighting fixtures are mounted in a single operation, rolled into place, assembly-line fashion. From a platform at one end of a plant, one length of busway after another is placed on roller-type hangers and then mechanically and electrically joined to the preceding length. At the same time, fluorescent fixtures, which the busway feeds and supports, are hung. A mechanically or electrically driven winch at the opposite end of the plant continuously draws this busway with its lighting fixtures through the roller-type hangers until the

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Where do you stand?

An outstanding authority on electrical product distribution suggests that many problems of the industry would be quickly solved if manufacturers and distributors alike would adopt a firm policy and then let their customers know exactly what that policy is.

By Arthur W. Hooper, Executive Director, National Association of Electrical Distributors, New York, N. Y.

◆ JUST BEFORE the presidential nominations last June, both major parties submitted in writing to the American public a list of the policies they would adhere to in the coming elections — and four years hence. These were the "planks" that went to make up their respective party platforms. Each candidate pledged himself to stand on his party's platform and to carry out its policies to the best of his ability.

The American voter made his choice on that basis. He didn't do it blindly. He knew what he wanted because he had the facts before him before he decided, and he exercised his right to express his free choice.

I think the time has come for businessmen to exercise this same free choice. I think it is high time that we in this industry were given the same opportunity to learn about the people we do business with and to express ourselves on whether we want to continue that relationship or take our business elsewhere.

Customer wants to know

As one contractor at the NECA convention told me in San Francisco: "I don't care what the distributor decides is the policy for his firm — that's his right. But, if he is doing business with me, I think I am entitled to know just exactly what that policy is."

I am convinced that most of the problems in this industry would disappear almost overnight if every firm in the electrical business would declare just what platform it stood on — what its policy is.

Here's how such action would help:

1. It would lead to a greater realization that the establishment of a true value for a product requires the performance of certain functions by specialized business organizations.

2. It would enable the industry to recognize that there is a difference between cheap distribution and economical distribution.

3. It would help the various branches of the industry to appreciate the other fellow's problems.

In looking down the list of why manufacturing companies fail, I have never seen the reason expressed as the failure to get and hold an efficient distribution system. And, yet, I believe the failure to obtain good distribution has contributed more toward the downfall of producers than all of the other reasons put together.

The mere production of an electrical product simply gives form to raw materials. Unless there is power to operate the product; unless it is available at the right place, at the right time, in the right quantity; unless it can be sold, installed and serviced properly — it has no true value.

And yet, many managements of businesses at all levels in the electrical industry today are losing sight of the fact that the value of an electrical product is practically nothing unless all the links in the chain of commerce are cast strong and fastened together securely.

The present and future health and welfare of this electrical industry depends largely on our ability to make a clear distinction between economical and cheap distribution. Economical distribution is efficient distribution — it is distribution that recognizes its obligations to itself, its customers and suppliers, and carries out its responsibilities in a manner that contributes to a higher standard of living for the American public. Cheap distribution is characterized as such because it lacks loyalty, quality, competence, and responsibility.

"Economical" versus "cheap"

Any manufacturer worth his weight can make that distinction between economical and cheap distribution. By a survey of his own distribution system he could determine if he has the loyal distributor who stands in back of the products he sells; the quality distributor who sells product not price; the competent distributor who lives up to his obligations as a selling partner; the responsible distributor whose name in his marketing area is a credit to the supplier he represents.

The manufacturer is entitled to know all these things. He is entitled to know that the distributors he has selected to handle his merchandise are firms with a policy — firms that know where they stand — firms that will be loyal and render a quality job of wholesaling his goods. His name, his product, his future is wrapped up in that distribution system, and he has the right to expect only the very best from that investment.

But with this right also come corresponding duties. If the manufacturer expects loyalty *from* his distributors he must also be loyal *to* his distributors, and so on down

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The wholesalers' place in product distribution

The opinion of this well known electrical manufacturer, backed by fifty years of experience, is that wholesalers can best perform the distribution function between manufacturer and contractor. Here are some of their reasons for adopting this policy.

By Edward C. Hewitt, Vice-President in Charge of Sales, The Thomas & Betts Co., Elizabeth, N. J.

◆ MUCH HAS BEEN SAID and written on the subject of distribution over the years. However, in my opinion, it's a subject that will bear constant and repeated review and clarification for years to come, because of its vital position, right at the very heart of our increasingly complex economy. I know that the subject of distribution requires constant analysis and merits the understanding of all people who purchase, at least, because I am called upon to discuss the subject continually. Why?

I am charged with the responsibility for sales of a manufacturer of tens of thousands of electrical fittings so varied that the market is literally wherever there is a wire —electrical construction, maintenance, repair, components — for homes, factories, utilities, contractors, shipyards, aircraft, military and original equipment, to name a few.

Proved by experience

Our company's experience of more than fifty years has convinced us that wholesaler distribution reduces the manufacturer's selling cost and thereby reduces the selling price of our material to the end user. So our policy for many years has been to distribute our goods exclusively through qualified electrical wholesalers, not arbitrarily, nor because this group is a bunch of nice fellows we want to support, but for the hard-headed business reason that we just can't get our goods to market better or more economically.

I illustrate this discussion with my own company's operations, because I'm familiar with them, but it can safely be assumed that the same factors apply wherever a wide variety of items must reach a very broad market.

Nevertheless, almost daily, through personal contact, telephone, or correspondence, we are approached by well-meaning—and valued users of our products who wish to "make a saving" by "buying direct" from us. They're influenced, no doubt, by the economic theorists who, for too long, have enjoyed an almost unopposed field day harping on the theme that the "middle man" is simply a parasite, feeding on his "cut" from both the producer and the user. They don't stop to realize that, if this were so, the wholesaler would long ago have gone with the strong wind of modern competition.

Wholesale business up

The fact is that despite the many other distribution methods invented and tried in recent years, statistics show that the volume of business handled by wholesalers is increasing at a rate just a little higher than gross national product.

I sincerely hope that our arguments are usually convincing to the individual prospect. They should be, because they've stood the test of complete economic cycles of prosperity, depression, defense, war, and material shortages, without the necessity of any modification whatever.

During the war, they were accepted, after considerable discussion to be sure, by all government agencies without exception. It is notable that our Company earned five consecutive Army-Navy E awards, and we haven't billed the government yet! The sole reason is that even the government agencies concluded that our wholesalers performed certain essential distribution functions at less cost than we would have to charge.

I think Mr. Henry Ford II, in an address to the American Newspaper Publishers Association, made a very pertinent statement on distribution. He said, in part: "It's interesting that Marx and the old-time thinkers grossly underrated the importance of distribution. Blinded by dogma, their followers haven't seen the light. Consider the plight of Ivan. He works all day in a factory making shoes. One hundred miles away, his cousin Boris raises potatoes. Ivan wants potatoes and Boris wants shoes, but one hundred miles is a long walk in any language. So, Ivan goes hungry, Boris goes shoeless, and the economy goes nowhere!" This indicates a very keen understanding of the subject on the part of Mr. Ford, even though his commodity and its marketing process is relatively uncomplicated.

I think that our situation is much more typical, at least in the electrical industry. We sit at our plant—in our case, at Elizabeth, New Jersey—where we invent, design, furnish material and labor with its attendant overhead, and place finished goods on the shipping platform. But we're not through. To get our goods into the hands of our customers, there are still more costs to be absorbed, and they are just as real and important as the costs of manufacturing. They are the costs of distribution.

These goods, on our shipping platform, must still be sold to the user, they must be warehoused at point of sale, credit must be ex-

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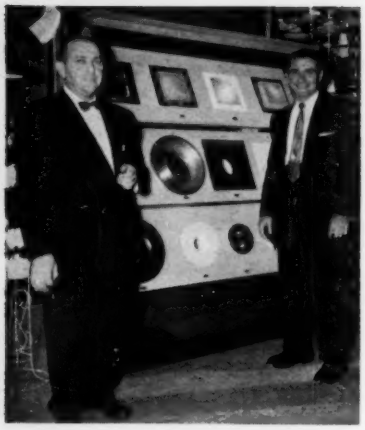
Made-to-order service ideas result in fourth branch plant



Fred Braverman, president, Consolidated Electric Supply, and Leonard Roberts, Progress Mfg. Co., inspect recessed ceiling fixtures display at recent opening.

This wholesaler's plan has been to merchandise not only supplies but new service ideas which, they believe, cost the least and pay off the most for contractors and suppliers alike. An overtime order filling system for early morning delivery is the mainspring of the expansion — the special service which has produced an impressive 30 per cent volume increase in less than two years!

TWO CASE HISTORIES

In this and the following article, the editors present two extremely different types of wholesale operations with a view of demonstrating the fact that customers of wholesale supply houses have widely varying requirements and that no one pattern of operation will necessarily meet every situation.

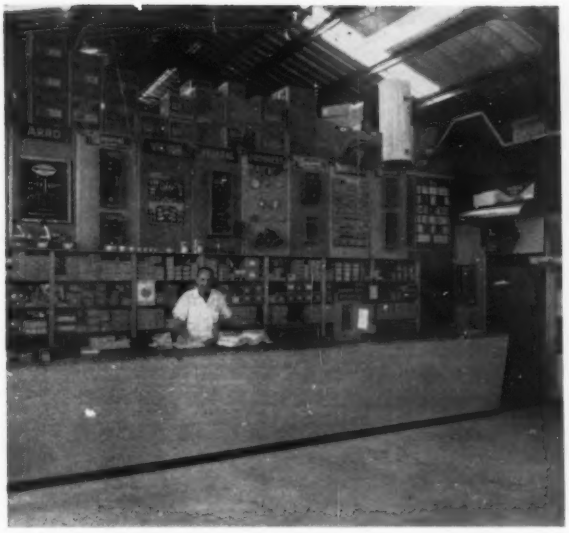
Exterior view of the new Melbourne branch of Consolidated Electric Supply shows the wide central drive-in for both loading and unloading — with the special display room for fixtures on one side. The shipping space is adjacent to rows of supply bins on the other side. The medium size building is 4,000 sq. ft. on one level with 20-ft. ceiling for high stacking of stock and for storing pipe.

◆ CONSOLIDATED Electric Supply of Miami, Key West, and West Palm Beach, has recently opened a fourth branch plant at Melbourne up the Florida East Coast near the Air Force guided missile base. This gives them almost continuous wholesale - distribution coverage along 400 miles of the fast-growing "Gold Coast."

In the new plant, President Fred Braverman has incorporated all the ideas and methods for giving fast, complete and accurate service to contractors that he has accumulated in 35 years in the business. His associates also have contributed much from their experience.

The plant is not large or elaborate — for Melbourne is a moderate-sized population center — but it is designed to carry out the specific progressive methods that have helped this firm to make a very fast growth. Their plan has been to merchandise not only supplies but new service ideas. The latter, they believe, cost the least and pay off the most for contractors and jobbers alike, as compared to other more expensive services and investments.

The basic distribution methods, as expressed in the plant, are: the streamlining of order filling and delivery for faster service; the doubling up of some members of the staff in different jobs to cut costs and expedite service; an efficient set-up and system for added sales and deliveries per unit of personnel; consistent pay incentives and training for individual promotion, to make every man



The 20 ft. city counter, at left, has an effective display of dozens of modern devices and special items about which the busy contractor needs to be reminded. Special office look-out windows at right (and another not shown) enable manager to observe all areas of plant. The photo at right shows the packing area where orders are loaded. Steel stock bins and wide aisles facilitate pulling up orders.

more interested in his work and aware of his personal stake in the company's success. The result is a far larger volume of sales *per man* than most jobbers can match, they say, and also continuous rapid gains in gross business with no "ceiling" yet in sight.

Overtime delivery system

The mainspring of the expansion is still Consolidated's original "overtime" plan for speeding up both emergency and regular deliveries to contractors on the jobs — the special service which has produced an impressive 30 percent increase in wholesale volume in less than two years following the reorganization of the firm.

The essence of this system is the training of a special staff of order clerks to stay on duty till 6 o'clock every workday evening and take telephone orders which are guaranteed to be delivered to the jobs by 7 or 7:30 the next morning. Some of the same staff put up and load these orders systematically on the delivery trucks that same evening. The loaded trucks are locked in the warehouse ready to roll the first thing the next morning. Duplicate lists of the items are sent out with each order as delivery receipts, and most orders are priced and billed the day of delivery. Others, going out in the late afternoon, are billed the following day.

This speed-up plan calls for skilled shipping clerks, and truck drivers who are also trained to "double up" as order assemblers, to put in an extra hour or so at night, and another extra hour the next morning — for which they receive substantial extra pay.

And this system has worked like magic, the firm reports, in boosting sales volume sharply in every city where it has been tried. It permits the busy contractor or his supervisor to take a last look around the job, after each day's work is over, and then order by phone any overlooked or "short" items or materials they need for the next morning's work — with the assurance that supplies will be delivered before they are wanted.

Many jobbers laudably give a lot of thought to planning how to aid contractor customers in many ways that often involve much time and money. But Consolidated salesmen report that the installation boys tell them that nothing helps them as much as getting immediate delivery on assorted items for today's or tomorrow's work schedule — parts that have been overlooked or ordered in insufficient quantity, or in the wrong size or model. When an electrician, whose time must be charged for at around $6.50 an hour, is held up or his work plan dislocated, that spells real trouble in the dollar column!

All supply firms try to speed up deliveries, and like Consolidated often deliver special items all through the day, but most of them are not set up to handle these orders in quantity after hours and before work starts in the morning. Even if the contractor ties up a man and sends his own truck after materials in the morning, there is usually *some* delay in authorizing, pricing and assembling the order — especially if a number of other contractors are on hand with the same trouble at the same time. If these orders have been cleaned up the night before, the shipping department starts out with a clean slate every day on new business.

The great advantage of the overtime system is that it substantially increases turnover with a relatively small per-item increase in wages, and does not increase other overhead costs enough to talk about. It takes from two to four men in each plant to put up the overtime orders.

The success of this plan as a long-range business builder is the factor which has enabled this wholesaler to expand into the fourth plant at Melbourne.

New plant design

After years of adapting to jobbing needs existing buildings which were put up for other pur-

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Although Berg Electric is 'way out in the sticks', the location eliminates irksome in-town parking problems and "next-door" competition. Harry Berg, left in second photo, is well known for his interest in beginning contractors. Stock of supplies and fixtures is high for the mid-Florida area.

Backwoods location proves

Being located between towns and on an under-traveled rural highway goes a long way in enabling this enterprising Florida wholesaler to realize a $200,000 gross, most of it in lighting fixtures. The unique credit commission given contractors whose customers buy fixtures and supplies is another successful feature of the growing firm.

◆ BERG ELECTRIC, of Sarasota, Florida, is living proof of the old saw that "if a man preach a better sermon or build a better mousetrap than his neighbor, the world will beat a path to his door, though it be in the woods."

For that's just where Harry Berg is. Yet being located between towns and on an under-traveled rural highway, doesn't keep Berg from racking up a gross of $200,000 in electrical supplies, most of it in lighting fixtures.

"If you keep ample supplies and give electrical contractors the service they need to stay in business," said Berg, "they'll find you as sure as folks find a short-cut across a corner lot!"

Add to this terse summation of his success, Berg's sincere interest in the problems of his customers (he was an electrical contractor for years), and the fact that he evinces as much concern over the order of a beginning contractor hesitantly deserting journeyman ranks to strike out on his own, as he does over the kingsize order of an established contractor, and you have an overall picture of why he manages to get so much business out in the deserted area that is the Berg trading domain.

Service fosters growth

Berg started his fledgling supplies house in his between-towns location two years ago, in a 20 x 20 building. It now occupies a 28 x 100, with a second story 28 x 40 feet. This wholesaler's shade-tree business zooms because Berg makes the most of his scattered market by being excited and informed about his merchandise, and by taking the time to chat with contractors on their problems. His advice is revered because it bears the unmistakable stamp of experience in the electrical business.

For example, many electrical contractors combine merchandising with contracting. Since two widely different principles are involved in contracting and merchandising, because a contractor first sells and then buys, as opposed to a merchant who first buys and then sells, the dual role of merchandising-contracting is not often a happy combination.

Berg feels that the sale of lighting fixtures and appliances often becomes attractive to electrical contractors because quick profits result, compared to the time required to complete even a small contract. The danger is that an electrician experienced in contracting cannot recognize the hidden costs of merchandising which involve breakage, display, depreciation and obsolescence.

As a consequence, and to make the task of the contractor seeking to fixture up a job easier, Berg set up a fixture-display room outstanding in his area for quantity and variety.

Over six-hundred fixtures are on display, and Berg says: "there is just one thing to remember about having a showroom-either have a nice one or don't have any."

He goes on to explain that the showroom needn't be large, nor does it have to get first priority in space, but it must be an appealing and sales-getting aid.

In his unorthodox location, Berg's firm does not depend upon the impulse buyer or passerby to drop in. Most of his trade comes to Berg's fixture display through his contractor-customers who have a definite purpose in mind, to satisfy the folks for whom they're making a wiring installation, and to make a satisfactory commission on the fixtures they buy. In this respect, Berg must carry an extent and variety of fixtures that will insure the customers will trade with him and not go where

advantage to wholesaler

the contractors may receive a lesser commission or none at all, as when they shop in hardware or chain stores.

Care is devoted to the arrangement of the showroom itself. For example, since lamp-post lights are a fast-moving number in this area where new housing sub-divisions blossom almost overnight, an entire wall of the showroom is given over to their display. Keeping in mind his small, beginning contractors who can ill afford an elaborate fixture showroom of their own, Berg offers them and their customers an inviting display which any contractor—big or small—might envy.

Privacy in showroom

An important feature of Berg's fixture showroom is that it was cannily arranged so that contractors and customers can walk in, look around and inspect the fixtures, all tagged with list prices, and talk privately just as if they were in the contractor's own showroom.

Frequently, the customer-contractor visit is made with either few or no words between Berg and the contractor, thus giving him an opportunity to talk over a purchase with the customer whose house or business establishment is being wired.

"We don't push them at any time," Berg points out. "However, if they want assistance or wish to talk things over, I'm ready to offer prompt and courteous service."

The privacy thus afforded the customer and his contractor seems invaluable as an asset to clinching sales.

Berg's service to contractors also is exemplified in the complete catalog and price service he makes available, and the fast delivery service given on all orders to speed them to the contractor on time.

And for each fixture sample displayed of the Gill, Globe and Progress lines Berg carries, at least half-a-dozen are stocked, to minimize delivery delays. It is understandable that contractors who come in from distant jobs for supplies relish the thought of loading up with the needed fixtures at the same time. Adequate stocks comparable to those in big-town stores make this possible at Berg's.

Other factors that make this backwoods supplier popular among contractors involve such things as easy access from arterial traffic routes; absence of frustrating in-town parking problems, and the closer personal relationships that Berg fosters with his patrons, beside the fact that he carries such a complete line of other electrical supplies as to make his place known as a one-stop store.

Contractor commission

"Fixtures and electrical supplies go together," said Berg. On this principle he attracts contractors by never handling trashy fixtures. And should a customer walk in and buy a fixture for cash, and at the list price, some adroit questioning by Berg elicits the name of the electrical contractor doing the wiring.

Berg immediately notifies the contractor that a credit commission awaits him. Since this credit is only applicable on purchases, Berg gains new contractor-customers right along, since the customer may, for reasons of his own, have decided not to go to the fixture house of his contractor's choice.

By the same token, the contractor may never have dreamed of dealing with Berg, but the bait of waiting commission attracts him to Berg. Once there, and discovering the full lines carried of most of the supplies he needs, at prices comparable with that at his regular supply house, the contractor is very apt to join the ranks of this "between-towns" supplier.

Furthermore, many of the city contractors wire out in the county, and it is easier to make a quick dash to Berg's for some needed item than to make the longer trek to town. This fringe business is highly regarded by Berg as a prelude to acquiring new customers among the area's contractors.

At first, Berg sent cash commission checks to contractors whose customers dropped in to view and buy from his mammoth fixture display.

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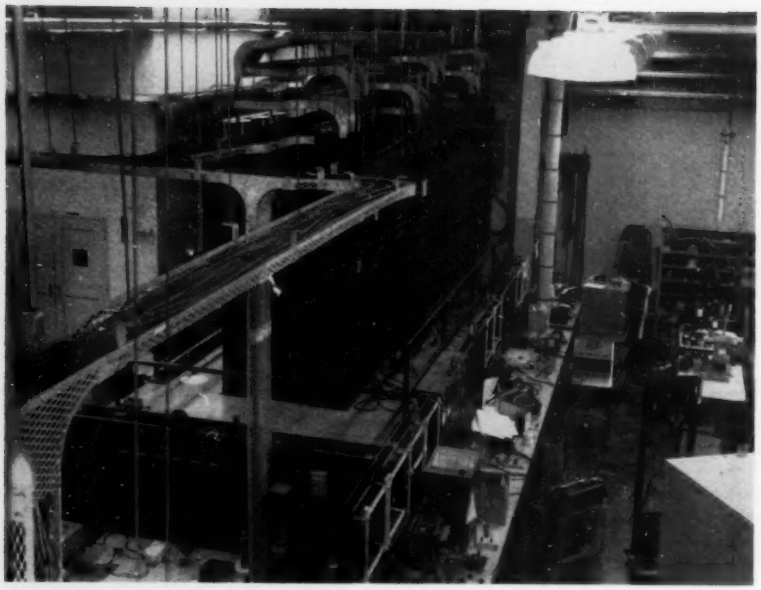
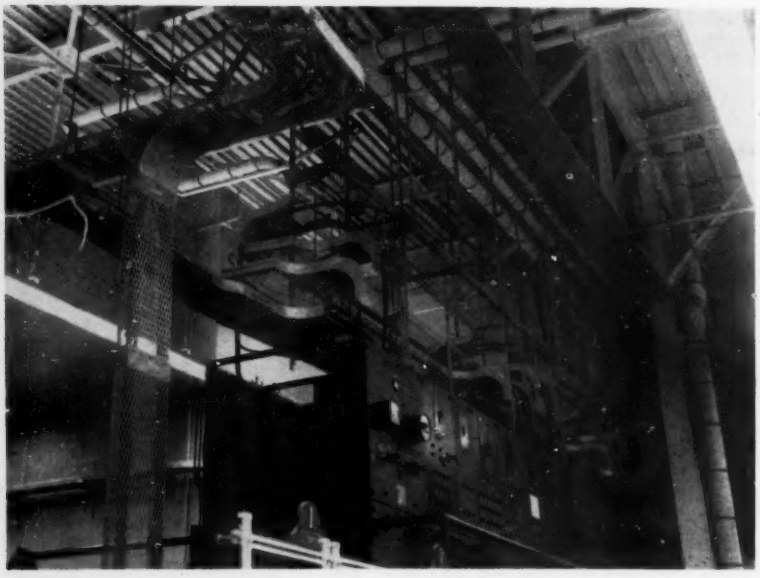
Contractors get at Berg's country supply house a greater fixture selection than is handled at many big city suppliers. In top photo, Mr. Berg, left, helps contractor decide on fixtures and make an estimate. The showroom is arranged so that contractors and their customers may browse in privacy.

Laboratory wiring carried



Note the ease and flexibility with which this high concentration of wiring at the General Electric Laboratory in Waynesboro, Va., can be handled through an expanded metal cable trough system. Standard fittings make changes in size and direction of raceways practical.



Note connections from expanded metal cable trough to back of distribution panels. Easy accessibility is provided for placing additional cables or making changes. Wires can be dropped in from above.

Expanded metal troughs find advantageous application in plants where numerous circuits may require complete accessibility for fast change and easy inspection.

◆ OPEN WIRING, resting in expanded metal troughs, has been coming into increasing use in certain industrial plant areas, especially those where wiring must be completely accessible for frequent and immediate changes and additions to circuits.

A typical example of this application is to be found in the Engineering Laboratory and Test Facilities, at the Specialty Control Plant of the General Electric Co., in Waynesboro, Va. A single central distribution section in the Engineering Laboratory provides seven different types of current, including alternating current in both single and three phase, at voltages extending from 110 to 550, at frequencies of 60 and 400 cycles, and direct current.

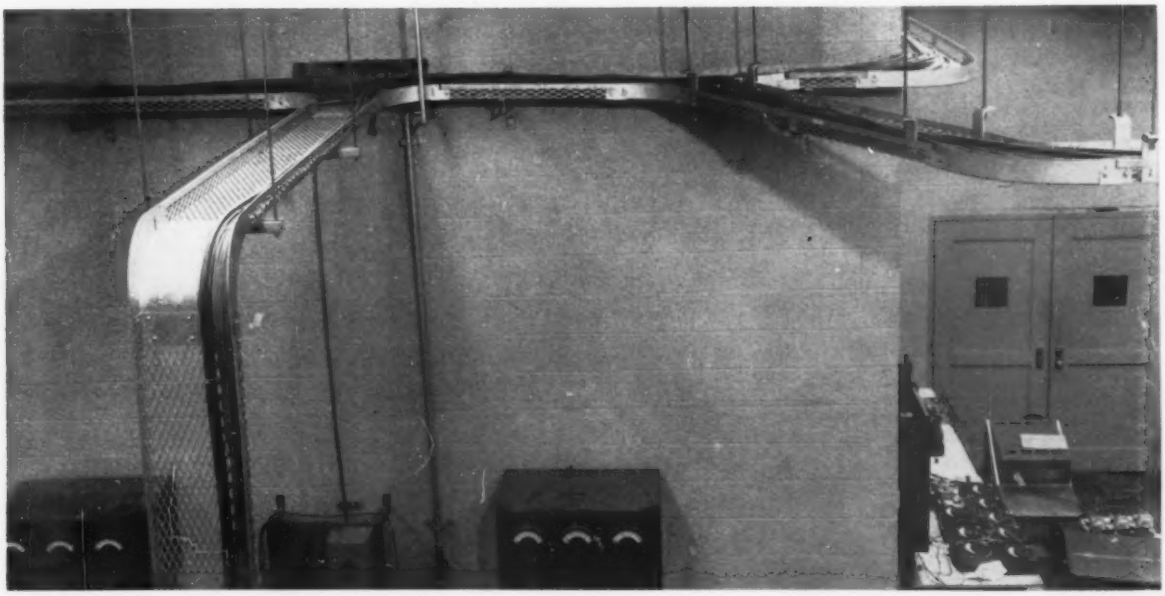
Distribution of these circuits to all parts of the laboratory is accomplished by means of Cope expanded metal cable trough. The designers of this installation point out that the open wiring provides quick access for circuit changes; permits higher current ratings for cables; and low initial cost through savings in both materials and labor.

Distribution of laboratory power and control cables by means of overhead trough around the periphery of the laboratory, as well as across it at several points, puts all facilities within immediate access of every test bench and individual laboratory room. Vertical runs along the walls connect with horizontal runs under the test benches so that many of the electric facilities can be tapped at any point.

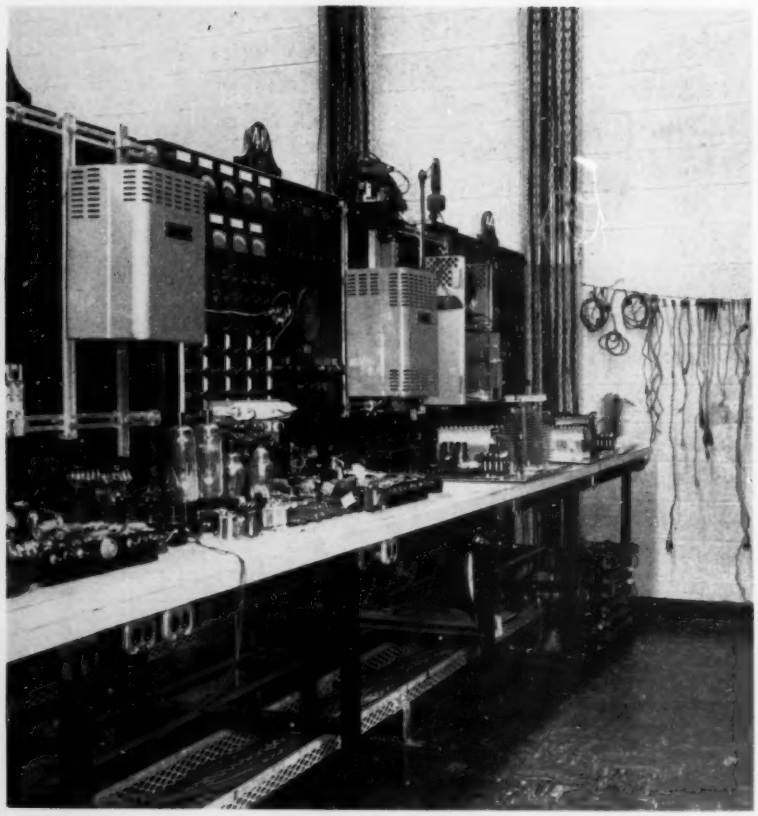
All permanent electrical installations of individual pieces of electrical equipment, of course, were made with electrical conduit.

in expanded metal troughs

Expanded metal cable trough is installed around periphery of mezzanine platform which contains all switchgear, motor generator sets, etc. Cable is at all times accessible for easy changes (note splices in cable in foreground) and additions to the circuit as needed for the test program.

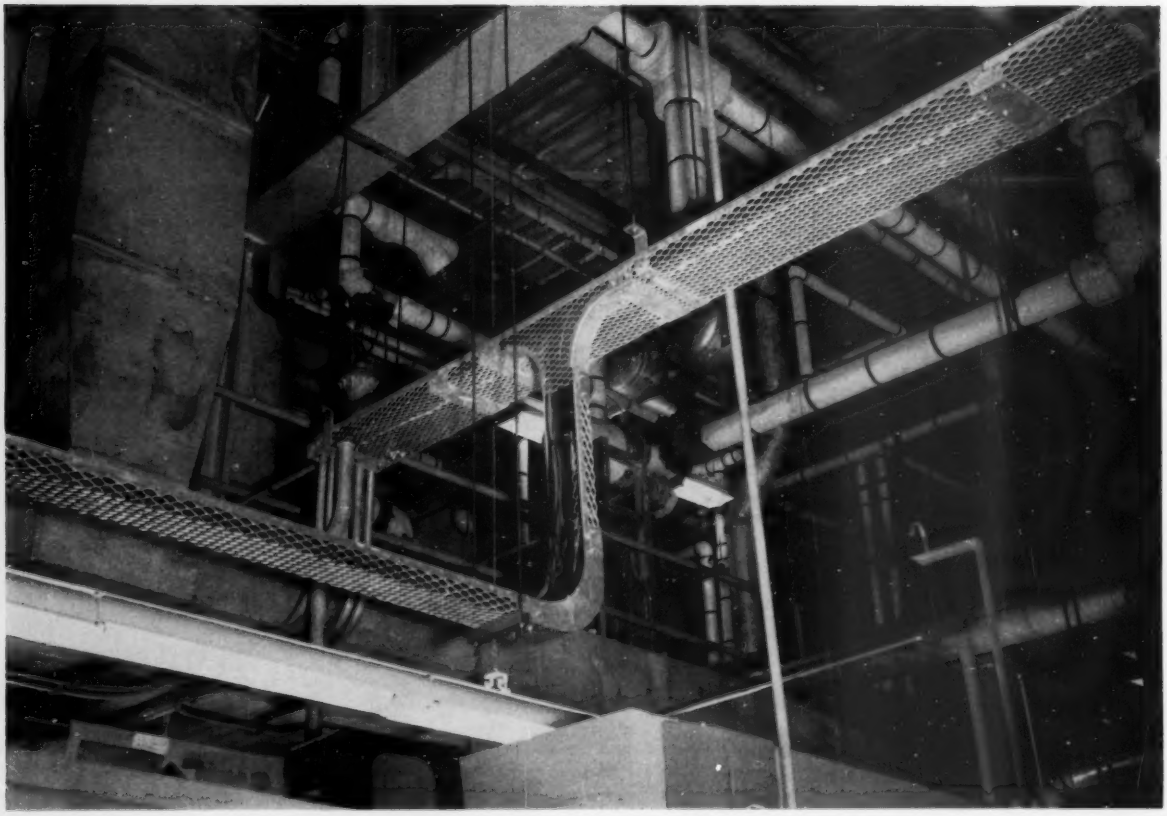


Standard fittings provided by expanded metal cable trough make branch runs and changes in direction simple and easy, eliminating costly cutting, threading, fitting. Installation is accomplished rapidly even with unskilled labor, and over-all cost is relatively low. Troughs are space-savers, too.



Left, vertical runs of expanded metal cable trough deliver cables to horizontal runs under the test benches. Note the simple ties that hold the cable in place on the vertical runs and the easy accessibility for quick change or running of additional circuits provided by the horizontal runs under benches.

Below, note the neat, uncluttered manner with which seven different currents (a-c in 60 and 400 cycles, single and three-phase, voltages from 110 to 550 and d-c) in multiple circuits are carried across the ceiling and distributed to serve individual pieces of test equipment. For permanent installations of individual pieces of equipment requiring little electrical service, conduit is used.



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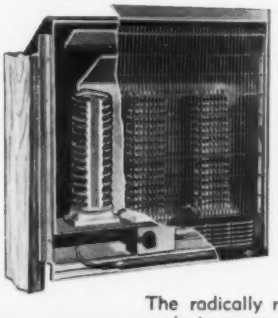

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Comment on the Code

Questions and answers on the National Electrical Code constitutes one of the principal features of the annual meeting of the Southern Section, IAEI. Here are verbatim excerpts from the stenographic report* of the meeting held in Dallas recently. Frank Camus, electrical contractor, and B. Z. Segall, consulting engineer, presided over the Code discussion panel sessions.

Question: "Why does Section 2124b still require a grounding outlet for laundry appliances, when washing machines do not have three conductor cords with polarized caps?"

Joseph Whitner: That is just an effort to encourage the grounding of electrical equipment. We have made that much headway in getting grounding of this equipment, and the new Code is going a step further in requiring grounding receptacle in any damp place such as in a breezeway or places like that, where you are apt to get in contact with a grounded surface.

Question: "If a clothes dryer and automatic washer are installed adjacent to each other, are two grounding type receptacles required?"

Joseph Whitner: Notice the wording here, it says at least one receptacle should be provided. So if you have two appliances at heavy capacity, I don't see how you could possibly put both of them on the same circuit. You would need two grounding receptacles in the same location. That would be my understanding of it.

Question: "Is it the intent to prohibit the use of autotransformers for fixed voltage adjustment, such as stepping up or down for polyphase motors?"

H. H. Watson: It is not the intent of Section 2003 to prevent the

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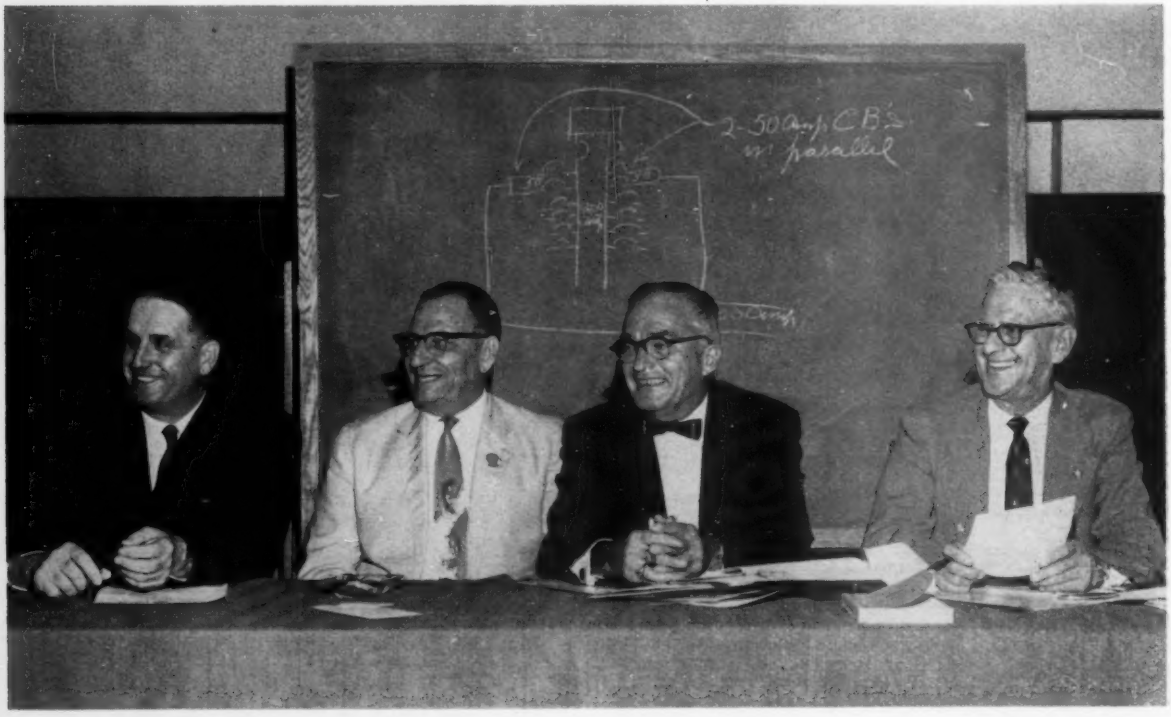
*** Attention is directed to the fact that the individuals contributing answers have not had an opportunity to review or edit their comment. While the stenographic report was made by an experienced court reporter, there is always the possibility that a comment might be recorded incorrectly. Any use made of the information contained here should be made with this fact in mind. In presenting excerpts from the complete report, the editors have been careful not to quote comment out of its context.**



The new officers of Southern Section, IAEI, for 1957 are either naturally pleasant men or else particularly pleased over the prospects for 1957. Left to right, R. E. Ward, Nashville, chairman of executive committee; L. W. S. Cosens, Sr., Miami, first vice-president; W. H. Foster, Houston, president; and A. M. Miller, Richmond, Va., secretary-treasurer. Diagram on board shows practical nature of Code discussions.

Officers and executive committee of the Southern Section, IAEL, for 1957: (seated, l. to r.) R. L. Crawford, Augusta, Ga., past-president; L. W. S. Cosens, Sr., Miami, first vice-president; W. H. Foster, Houston, president; A. M. Miller, Richmond, secretary-treasurer; and R. E. Ward, Nashville, chairman, executive committee; (standing l. to r.) L. A. Turnage, Hartsville, S. C.; E. L. Brindel, Roanoke, Va.; Paul Meginniss, Miami; Charles G. Butler, Decatur, Ga.; C. R. Kennedy, Greensboro, N. C.; M. W. McRaven, Houston; A. J. Bech, New Orleans; and W. A. Cochran, Jr., Birmingham, all members of the executive committee. Not in the picture: C. B. Grauer and J. N. McCammon, both of Jackson, Miss.

arrangement you are talking about. It is only required that Section 2002 be met which says: "No interior wiring shall be electrically connected to a supply system unless the latter contains, for any grounded conductor of the interior system, a corresponding conductor which is grounded." A continuous ground, if carried through, answers the requirement. . .

I think it is important to call attention to a fine print note in the 1936 Code which has been added to 2002. It is a fine print note and it will say—"Electrically connected implies connection capable of carrying current as distinguished from connections through electromagnetic induction."

There's been some confusion about circuits derived from ungrounded three-phase systems to supply lighting. It's been customary in many locations, and the Code recognizes as correct, to install two winding transformers for the energizing of lighting circuits, and establishing a ground on the secondaries of these circuits.

That recognizes that as the proper method for making the ground of these lighting circuits—a clarification that has been necessary for some years, and I think it explains completely questions that have come out of the Southern Section.

Question: "Is it the intent of Section 2127 to permit range components as separate assemblies to be supplied from 50 ampere branch circuits without overcurrent protection to the separate assemblies?"

H. H. Watson: Mr. Chairman, why don't you read that other request for discussion and get that over with? It may take care of all the discussion that may come up from this type of equipment.

Frank Camus: We have about four questions pertaining to the same problem in our group of questions here, and Mr. Watson being chairman of that committee has asked me to make this announcement as a question. He is chairman of the National Electrical Code Correlating Committee's subcommittee on separate oven and cooking top wiring.

"I would like to have from the active inspectors of this Section reports of any of the experiences they have had or occurrences they know about which will guide my subcommittee in preparing proposed Code coverage for this new development. We know what the problems are; what we need is a record of accidents or malperformance."

In other words, in general, Mr. Watson wants to know if any of the active inspectors have had any occurrences or any experience with the installation of the separate cooking components, from say a 50 ampere branch circuit, and taking advantage of the 5-foot tap rule, and tapping from three number eights or three sixes, over to the oven.

H. H. Watson: Mr. Brandon has appointed a technical subcommittee to take a look at these ranges and ovens which are installed separately. We know what the problems are. It is whether to

ground, and where the ground should be applied; whether or not those can be added to the same branch circuit, or whether separate circuits are required; what the overcurrent protection requirements are.

There are a number of problems that have to be settled.

Now, what my committee would like to have from you people is any reports of difficulties that have been encountered with these ranges; in the Northwest Section there were reports of fires from cooking tops improperly installed. In the Western Section there were several reports of shock to housewives operating the ovens.

What we'd like to have from you people are any experiences you may have had which my committee should know about, so that when we write up Code requirements, we will have covered all your difficulties.

President Crawford: We have a number of that type of installation, but we require separate circuits, separate overcurrent devices, require grounding it, and we have not had any where you separate the oven from the cooking top. That is required to be grounded separate circuit. We have not had the first bit of trouble.

Frank Camus: We agree with you, most of us do anyway, but that isn't the Code. The Code says very plainly and clearly that you may connect ovens such as described in this question. In other words, you may run a 50-ampere circuit up to the location of your oven components and your table tops and supply them there, taking advantage of the 5-foot tap rule, and it is going to be changed in the new Code, so you can take number 6 wire.

M. M. Brandon: In answering such a question, I must remind you that this is purely my opinion. That is what you are asking. There is nothing official about it. Many of the people on the Code may not agree with my opinion.

The 5-foot Section, 2434c, would not include electric ranges, and it wasn't intended to do so. It was for use in equipment, and that was primarily switchboard or panelboard or the like.

W. A. Stall: Mr. Chairman, you have another rule in Article 210 that says, "All fixed appliances must be wired with the proper overcurrent protection for that particular appliance." That is the way I do it. We put a separate branch circuit in there.

Frank Camus: Mr. Stall, I think a lot of us agree with you, but the thing here is the wording of the Code, does it permit it?

Joseph Whitner: It would seem to me that 2126c permits more than one appliance. In other words, the several units of this which are separated and therefore separate appliances, can be supplied from that. With that in mind, I don't see where the 5-foot rule enters into it. It is just another ampere circuit of appliances.

Frank Camus: You have got to take advantage of the 5-foot rule in order to make your proper taps from your large conductors to your range top.

Joseph Whitner: There are separate appliances here.

Frank Camus: But most of them are connected direct to the oven. There is no heavy duty plug. It is the wires that go into the oven and in order to accomplish that, you have to take advantage of the 5-foot rule.

Joseph Whitner: In this table here, it says what size taps you can use to your appliances. It looks to me like this takes care of it, it is just individual appliances.

Frank Camus: In other words, in your opinion, it is permitted in the Code, right?

Joseph Whitner: That is my opinion.

M. M. Brandon: Now as to a 5-foot tap, you are confusing the issue by bringing in a tap. You threw in another question, can you use a 5-foot tap and a smaller conductor. I think the answer is no. I think the two are separated. You can run the same size conductor to all these units, under 2126c.

H. H. Watson: As I pointed out, the subcommittee of which I am the chairman, knows all about these problems. We have heard these arguments. This is the fifth meeting in which the same discussion has taken place. I still would like to know if any active inspector here has seen a cooking top or an oven where there has been an electrical accident, shock, fire, over-current, anything we should know about that would guide us in the preparation of some proper language to cover these appliances in the Code.

Harry Thomas: I'd like to say we did have two accidents, two fires, and one child was shocked from one of these small things not grounded, in Memphis, so now we have changed our rule in which we require a separate ground circuit for each unit. I think some recommendation should go into the Code to make this specific more than having to jump about to four or five different articles.

Secretary Miller: Mr. Chairman, probably Mr. Watson's question isn't a fair question. I imagine that most of the inspectors in this room have tried to anticipate trouble and have prohibited their use on a 50-ampere branch circuit without protection to the individual units.

Ralph H. Wellwood: The biggest trouble is it all falls right back on your workmanship. Eighty per cent of the ovens I find are ungrounded, and I have got to send an electrician back. There is your trouble right there.

Ed Wheat: Is it permissible to use a neutral conductor for the oven in a range top?

H. H. Watson: The manufacturers of ovens, the range and water heater section of the Electrical Manufacturers Association, have recommended unofficially now to my committee that these devices not be grounded to the neutral, but that they be grounded through a separate grounding conductor. They are willing to accept for permanently-connected appliances, that method of grounding where they still want a range to be grounded to the neutral, as you now do it.

Frank Camus: We want to know whether the Code permits it, Mr. Watson.

H. H. Watson: The Code doesn't touch that subject directly. The Code did not anticipate it when it was written. An oven and a cooking top as two separate devices, the problem we are concerned with here is exactly that. We are trying to apply Code rules that were written before we knew about the existence of these devices.

Mr. Miller, Miami: Does it make any difference? We have an oven and a top, the same as we have an electric range, and we didn't provide separate over-current devices to the oven from the cooking top, did we?

Frank Camus: No. That was the argument of those that allowed that to be done, because the labs inspecting these ranges allow a smaller wire, and they take advantage of that 5-foot rule to supply different parts of the range. Now, the same thing is done, is permitted in the Code, as I understand it, when you have your oven here and your range top there.

(Continued on page 118)

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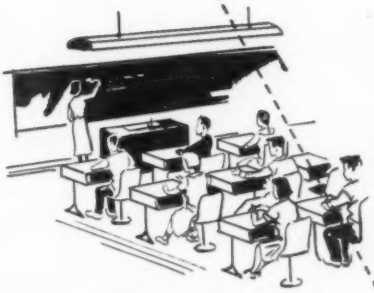

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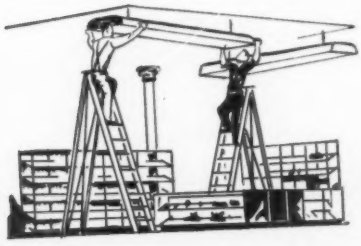

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Changes in the 1956 Code

H. P. Michener, of the National Electrical Manufacturers Association, has compiled an "Analysis of the 1956 Revision of the National Electrical Code," discussing the changes that have been incorporated in the new Code that became effective in October 1956. Through the courtesy of the Association, Electrical South presents a discussion of some of the more important changes.

ARTICLE 100 — DEFINITIONS

***Branch Circuit—Appliance**

This is a new term with the following definition:

An appliance branch circuit is a circuit supplying energy to one or more outlets to which appliances are to be connected; such circuits to have no permanently connected lighting fixtures not a part of an appliance.

Branch Circuit—General Purpose

This is a new term with the following definition:

A branch circuit that supplies a number of outlets for lighting and appliances.

Branch Circuit—Individual

This is a new term with the following definition:

A branch circuit that supplies only one utilization equipment.

***Ground**

This is a new definition reading as follows:

A ground is a conducting connection, whether intentional or accidental, between an electrical circuit or equipment and earth, or to some conducting body which serves in place of the earth.

***Grounded**

This is a new definition reading as follows:

Grounded means connected to earth or to some conducting body which serves in place of the earth.

***Grounded Conductor**

This is a new definition reading as follows:

A conductor which is intentionally grounded, either solidly or through a current-limiting device.

***Grounding Conductor**

This is a new definition reading as follows:

A conductor used to connect an equipment, device or wiring system with a grounding electrode or electrodes.

ARTICLE 210—BRANCH CIRCUITS

2124. Receptacle Outlets Required. b. Dwelling-type Occupancies

The requirement for one receptacle outlet for every 20 linear feet or major fraction of distance around every kitchen, dining room, breakfast room and bedroom has been changed to one receptacle for every 12 feet.

In addition to this major change, there has been added the requirement:

Receptacles installed in or on open porches, breezeways, garages, and the like, which may supply equipment to be used by persons standing on the ground, shall be of the grounding type.

There has also been an editorial change in the wording pertaining to the outlet for the connection of laundry appliances as follows:

At least one receptacle [outlet] *of the grounding type* shall be installed for the connection of laundry appliances. [This receptacle shall be of a 3-pole type designed for grounding.]

ARTICLE 220 — FEEDERS

2203. Calculation of Load

Revisions have been made in several of the paragraphs of this Section as indicated individually below.

2203.c.1 Small Appliances, Dwelling Occupancies. This subsection has been revised to list pantry and breakfast room along with dining room, kitchen and laundry for better correlation with Section 2115.b.

2203.d. Electric Ranges. The words "*single phase*" have been added before the word "ranges" in the last sentence.

2203.e. Fixed Appliances (Other Than Ranges and Space Heating Equipment). As an editorial change, the word "and" has been changed to "*or*". Air conditioning equipment has also been added along with ranges and space heating equipment since air conditioning equipments are frequently operated at rated load for long periods of time. With these revisions, this subsection reads:

e. Fixed Appliances (Other Than Ranges, Air Conditioning Equipment and Space Heating Equipment). Where four or more fixed appliances in addition to electric ranges, *air conditioning equipment* [and] *or* space heating equipment are connected to the same feeder in a single or multi-family dwelling, a demand factor of 75% may be applied to the fixed appliance load, but not including electric ranges, *air conditioning equipment* or space heating equipment.

A new paragraph has been added at the end of this subsection, reading as follows:

In adding the branch circuit loads to determine the feeder load, the smaller of two dissimilar loads may be omitted from the total where it is unlikely that both of the loads, such as an electric heating load and an air-cooling load, will serve at any time during any 24-hour period.

2203.g. Neutral Feeder Load. The change consists of the addition of the following:

In a feeder where the load consists of 50% or more of electric discharge lamp ballasts, there shall be no reduction in size of the neutral conductor below the size of the phase conductors.

This requirement was added because of evidence showing that three balanced single-phase fluorescent ballast loads, one on each phase to neutral of a 4-wire, 3-phase circuit, produced neutral currents approximating the phase current due to third harmonics developed by the ballast.

ARTICLE 230—SERVICES

2304. Size of Service Conductors. a. Service Entrance Conductors

The following fine-print note has been added:

It is recommended that a minimum of 100 ampere, 3-wire service be provided for all individual residences.

2322. Clearance of Service Drop

The introductory sentence of this section has been changed as indicated below:

Service drops shall not be readily accessible and, *for voltages not in excess of 600 volts,* shall conform to the following:

In this section, a fine-print note has been added reading:

For clearances of conductors of over 600 volts see National Electrical Safety Code.

The effect of this revision is to increase the clearances required for voltages of over 600 volts and to do it by reference to the National Electrical Safety Code.

2324. Point of Attachment to Building

The last sentence of this section formerly read:

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Where the form of the building will not permit the above clearances, the attachment may be less than 10 feet provided at least 12 feet clearance is obtained over residential garage driveways, and all other clearances are obtained and all ungrounded conductors and connections within 8 feet of the ground are properly insulated with rubber or equivalent insulation.

This sentence has been replaced with the following new one:

Where it is impractical to get the point of attachment high enough to obtain the above clearances, the clearance over residential driveways may be reduced, provided a clearance of 10 feet over sidewalks, 18 feet over alleys and public roads, and a minimum of 12 feet over residential driveways is obtained.

The new sentence continues the exception permitting 12-foot clearance over driveways, but removes the former exception permitting the point of attachment to be less than 10 feet from the ground.

2351. General. a. Switch and Circuit Breaker

The third sentence has been revised as indicated below:

Two or three single-pole switches or breakers, capable of individual operation, may be [grouped] *installed* on multi-wire circuits, [(where applicable, see Section 2353)] *one pole for each ungrounded conductor,* as one multi-pole disconnect, *(where applicable, see Section 2353)* provided they are equipped with "handle ties", "handles within 1/16 inch proximity," a "master handle," or "other means" making it practical to disconnect all conductors of the service with no more than six operations of the hand.

The change was intended as an editorial clarification.

2352. Connections Ahead of Disconnecting Means

To clarify that sprinkler alarms as well as other types of fire alarms may be connected ahead of the disconnecting means, the first sentence has been changed as indicated below:

Service fuses, meters, high-impedance shunt circuits (such as potential coils of meters, etc.) supply conductors for time switches, surge protective capacitors, instrument transformers, lightning arresters and circuits for emergency systems, fire pump equipment, [and for] fire *and sprinkler* alarms as provided in Section 2375, may be connected on the supply side of the disconnecting means.

2354. Types Permitted

To clarify that the intent of this section is to have manual means for ready operation whether there is a remote control or not and to allow reasonable means for fulfilling such manual operation, this section has been revised to read as indicated below:

The disconnecting means for ungrounded conductors may be a manually-operable switch or circuit breaker of the air-break or oil-immersed type, equipped with a handle [or lever] *or other suitable operating means positively identified and marked,* for mechanical operation by the hand.

This change covers interpretation No. 403. There has been no change in the fine-print note.

2386. General

Sections 2351 and 2371 have been added among those with which services exceeding 600 volts must comply. There is no change in intent.

ARTICLE 240—OVERCURRENT PROTECTION

2403. Overcurrent Protection of Conductors. b. Non-adjustable-trip Circuit-breakers

The second paragraph has been amended by the deletion of the words shown in brackets below so that the listed ratings apply to all non-adjustable trip circuit-breakers:

Ampere ratings for [molded case] circuit breakers are 15, 20, 30, 40, 50, 70, 100, 125, 150, 175, 200, 225, 250, 300, 350, 400, 500 and 600.

2405. Ungrounded Conductors

The last sentence of this section has been revised as indicated below: Individual single-pole circuit-breakers may be used for the protection of each conductor of ungrounded 2-wire circuits, each ungrounded conductor of 3-wire direct-current or single-phase circuits, or for each ungrounded conductor of lighting or appliance branch circuits connected to 4-wire, 3-phase systems, or 5-wire, 2-phase systems, provided such lighting or appliance circuits are supplied from a system having a grounded neutral and no conductor in such circuits operating at [more than 150 volts to ground] *a voltage greater than permitted in section 2113.*

This change was to correct an unintentional restriction on the use of single pole circuit breakers on 277-volt lighting circuits which had resulted from the previous revision.

2411. Fuses in Multiple

The phrase "except the conductors of motor branch circuits" has been deleted from the second line in this section so that fuses may be placed in multiple in motor branch circuits under the same limitations as for other circuits.

2434. Location in Circuit. c. Taps Not Over 10 Feet Long

This subsection has been revised by substituting *"10 feet long"* for "5 feet long." This change was made because it was found that the 5-foot limitation was inadequate to cover some of the larger types of equipment being manufactured today. Control centers in some cases have taps somewhat over the 5-foot limitation which was also inadequate for taps from overhead bus ducts to panelboards.

ARTICLE 300 — GENERAL REQUIREMENTS FOR WIRING METHODS

3023. Temporary Wiring

This is a new section reading as follows:

a. *Suitable disconnecting switches or plug connectors shall be installed to permit the disconnection of all conductors of the temporary circuit by a single operation.*

b. *No bare conductors nor earth returns shall be used for the wiring of any temporary circuit.*

ARTICLE 310—CONDUCTORS

3102. Conductor Insulation

The first two sentences have been revised as indicated below, correlating with new definitions in Article 100:

Conductors shall be insulated, except when [uninsulated] *covered or bare* conductors are specifically permitted in this code. Conductor insulations, as specified in the following table may be [used] *installed* for any of the wiring methods recognized in this chapter, except as otherwise provided for in the table or the notes following, or as otherwise specified in this code. They are suitable for 600 volts unless otherwise specified.

In addition, several changes have been made in the table:

1. The term "general use" has been replaced by *"dry locations"* and the term "general use and wet locations" has been replaced by *"dry and wet locations"* throughout the table:
2. The provisions for Type AVL have been changed to *"general use and wet locations."*
3. The type designations "RH, RW," has been changed to *"RH-RW."*
4. The entire item pertaining to Type SBW slow-burning weatherproof wire has been deleted since this type has fallen into disuse.
5. The new Type RHH wire has been added under the trade name *"heat-resistant rubber"* and with a 90 C and dry locations limitation.
6. The silicone rubber insulated fixture wires, Types SF-1, SF-2, SFF-1 and SFF-2 have been added to the table with their corresponding operating temperatures and uses. This constitutes regular recognition of these types which were first covered in Interim Amendment No. 103 effective August 17, 1955.

3105. Conductors in Multiple

The first sentence has been revised because of the occasional need for paralleling conductors larger than 500,000 CM. The revision is as indicated below:

Conductors in sizes 1/0 [to 500,000 CM., inclusive] *and larger* may be run in multiple provided they are of the same length and have the same circular-mil area and type of insulation.

ARTICLE 334—ARMORED CABLE

3342. Use

The second sentence of this section has been revised as indicated below:

Armored cable (ACV) may be used only for exposed work in dry locations in buildings [occupied] *used* for industrial *or commercial* purposes, and shall not be smaller than No. 4, except where approved for over 600 volts under sections 7105 and 7121.

This extends the permissible usage of Type ACV to buildings used for commercial purposes.

3347. Protection at Cable Ends

A new sentence has been added at the end of this section reading as follows:

Where change is made from armored cable to other cable or raceway wiring methods, an outlet box shall be installed at junction point as required in Section 3007.

ARTICLE 358—CELLULAR CONCRETE FLOOR RACEWAYS

This is an entire new article consisting of sections 3581-3591, setting forth the requirements applicable to precast cellular concrete floor raceways which are defined as the hollow spaces in floors constructed of precast cellular concrete slabs together with suitable metal fittings designed to provide access to the floor cells in an approved manner.

ARTICLE 380—SWITCHES

3814. Rating of Snap Switches. b. Tungsten Filament Loads

Introductory paragraph of this subsection has been revised as indicated below, the addition being indicated in italics:

For *a* tungsten filament lamp load[s], and for combined tungsten-filament and non-inductive loads, switches shall be "T" rated *or, if on a-c circuits, may be a general use a-c snap switch,* except where the three following qualifications are satisfied:

This revision is in line with official interpretation No. 397 recognizing the applicability of general use a-c snap switches.

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ARTICLE 410—LIGHTING FIXTURES, LAMPHOLDERS, LAMPS, RECEPTACLES AND ROSETTES

4184. Fixture Mounting

A new sentence has been added at the end of this section as follows:

Where fixtures are to be installed on combustible low-density cellulose fiberboard, the fixtures shall be approved for this condition or they shall be mounted not less than 1½ inches from the surface of the fiberboard.

Fires have been reported in fiberboard ceilings on which fluorescent fixtures had been mounted. The revision provides as alternates a spacing or approval of the fixture for the special conditions of use.

ARTICLE 422—APPLIANCES

4277. Controllers and Disconnecting Means

A slight change in subsection a has been made and a new subsection e has been added, the changes being as indicated below with deletions shown in brackets and additions in italics:

a. Thermostats and thermostatically controlled switching devices which indicate an "off" position and which interrupt line current, shall open [simultaneously] all ungrounded conductors in the "off" position *regardless of temperature.*

e. *Switching devices consisting of combined thermostats and manually controlled switches which serve both as controllers and disconnecting means:*

(1) shall open regardless of temperatures all ungrounded conductors when manually placed in the "off" position and

(2) shall be so designed that the circuit cannot be energized automatically after the device has been manually placed in the "off" position.

The change in subsection a is one of clarification of the intent to assure that both poles are open when the switch is in the "off" position. The new paragraph e covers those devices which can serve both as controllers and disconnecting means and results from official interpretation No. 428 that such devices satisfy the intent of section 4241.

4283. Installations of Heating Cables in Plaster

Subsection d has been revised as indicated below:

The entire ceiling surface shall have a finish of thermally non-insulating [plaster or of other approved] *sand plaster or other approved non-insulating* material having a nominal thickness of ½ inch.

The change is to make it clear that plasters having a high thermal insulation value are not approved.

Provisions for Air Conditioning Units

4291. General.

4292. Grounding.

4293. Branch Circuit Rquirements.

These three sections which were Interim Amendment No. 101, effective January 1, 1955, have been incorporated into the regular text of the Code.

ARTICLE 430—MOTORS AND MOTOR CONTROLLERS

4304. Identification of Motors

a. General Motor Applications.

The fourth sentence of this subsection has been revised as indicated below (words in brackets being deleted and those in italics added):

A motor provided with a protective device integral with the motor [(see section 4322)] *that complies with section 4322a2 or 4322c2,* shall [have a marking which will so indicate] *be permanently marked "Thermal Protection."*

4304.b. Sealed (Hermetic Type) Refrigeration Compressor Motors. The last sentence of this subsection has been revised as indicated below:

If a protective device integral with a motor is used (see Section 4322), the nameplate shall [have a marking which will so indicate] *be marked "Thermal Protection".*

These revisions are correlated with definitions added in Article 100 and with the NEMA Motor and Generator Standards.

4322. Continuous Duty Motors. a. More than one Horsepower

In paragraph 2, the former first and second sentences reading:

A protective device integral with the motor which is responsive to motor current or to both motor current and temperature. This device must be approved for use with the motor which it protects on the basis that it will prevent dangerous overheating of the motor due to overload or failure to start.

have been replaced by the following:

A thermal protector integral with the motor approved for use with the motor which it protects on the basis that it will prevent dangerous overheating of the motor due to overload or failure to start.

This revision was adopted on the basis that it was more definite and descriptive.

4322.b. One Horsepower or Less, Manually Started.

The first sentence of this subsection was revised as indicated below:

Any motor of one horsepower or less which *is portable,* is manually started and [which] is within sight from the starter location, shall be considered as protected against overcurrent by the overcurrent device protecting the conductors of the branch circuit.

Also, a sentence has been added at the end reading:

Any motor of one horsepower or less which is not portable, shall be protected in accordance with section 4322c.

This change requires motor overcurrent protection (other than the branch circuit protective device) for all non-portable motors even if manually started.

4424. Circuit Overcurrent Protection

Differential protection has been recognized by the addition of the new subsection e as indicated below:

e. Differential Protection. *Differential protection may be employed to protect an alternating-current motor, the motor control apparatus, and the branch-circuit conductors against overcurrent due to short circuits or grounds. When all these elements are included within the protected zone of a differential protective system the ratings or settings specified in Section 4342 do not apply.*

Note: A differential protective system is a combination of two or more sets of current transformers and a relay or relays energized from their interconnected secondaries.

The primaries of the current transformers are connected on both sides of the equipment to be protected, both ends of the motor phase windings being brought out for this purpose. All of the apparatus and circuits included between the sets of current transformer primaries constitutes the protected zone. The current transformer secondaries and the relay elements are so interconnected that the relay elements respond only to a predetermined difference between the currents entering and leaving the protected zone. When actuated the relay or relays serve to trip the branch-circuit circuit breaker, thus disconnecting the motor, control apparatus in the motor circuit and the branch-circuit conductors from the source of power and, in the case of a synchronous motor, de-energizing its field circuit.

ARTICLE 450—TRANSFORMERS AND TRANSFORMER VAULTS

4542. Walls, Roof, and Floor

A new sentence has been added following the present fourth sentence as follows:

Other forms of fire-resistive construction are also acceptable provided they have adequate structural strength for the conditions and a minimum fire resistance of 2½ hours according to ASTM Fire Test Standard E119.

There has also been added an exception:

"*See 4523a*", which refers to the 4-inch thickness of concrete permitted for transformers up to 112½ kva.

ARTICLE 500—HAZARDOUS LOCATIONS

5001. Scope. a

A second paragraph has been added to section 5001 reading as follows:

Equipment and associated wiring approved as intrinsically safe may be installed in any hazardous location for which it is approved, and the provisions of Articles 500 and 510 will not apply to such installation. Intrinsically safe equipment and wiring is incapable of releasing sufficient electrical energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture. Abnormal conditions will include accidental damage to any part of the equipment or wiring, insulation or other failure of electrical components, application of over-voltage, adjustment and maintenance operations, and similar conditions.

5015. Sealing. c. Class I, Divisions 1 and 2

5. Drainage. Several words have been changed in this subsection as indicated below in brackets:

Where there is probability that water or other condensed vapor may be trapped within [housings or] enclosure *for control equipment* or at any point in the raceway system, approved means shall be provided to prevent accumulation or to permit periodic draining of such water or condensed vapor.

A new paragraph numbered 6 under 5015.c has been added reading as given below and the existing paragraph has been renumbered from 6 to 7:

Where the authority enforcing this Code judges that there is probability that liquid or condensed vapor may accumulate within motors or generators, joints and conduit systems shall be arranged to prevent, if possible, the entrance of liquid. Where it is not possible to prevent entrance of liquid, and where means to prevent accumulation or to permit periodic draining are judged necessary, such means shall be provided at the time of manufacture, and shall be deemed an integral part of the machine.

The revision is to emphasize the desirability of preventing the entrance of water and secondly, to specify that where devices to prevent accumulation are needed, they should not be installed in the field, but should be part of the factory assembly of the motor or generator.

5051. General

As an interim amendment published as a part of the new edition of the Code, a second paragraph has been added to this section reading as follows:

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Dust-ignition-proof, as used in this article, shall mean enclosed in a manner which will exclude ignitible amounts of dust or amounts which may affect performance or rating, and which, when installation and protection are in conformance with this Code, will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

A second paragraph has been added to the fine-print note reading as follows:

Equipment and wiring of the type defined in Article 100 as explosion-proof is not required in Class II locations, and may not be acceptable unless approved for such locations.

This addition has been made because some Class I explosion-proof equipment is erroneously being installed in Class II locations.

5054. Wiring Methods

a. Class II, Division 1. 1. Fittings and Boxes. As a part of Interim Amendment No. 105, an addition has been made in the last sentence as follows:

Fittings and boxes in which taps, joints or terminal connections are made, or which are used in locations where dusts are of an electrically-conducting nature, shall be *dust-ignition-proof* and approved for Class II locations.

5055. Sealing, Class II, Divisions 1 and 2

The first sentence has been revised as indicated below as a part of tentative Interim Amendment No. 105:

Where a raceway provides communication between [a non-dust-tight fitting or enclosure and one which is required to be dust-tight] *an enclosure which is required to be dust-ignition-proof and one which is not,* suitable means shall be provided to prevent the entrance of dust into the [dust-tight] *dust-ignition-proof* enclosure through the raceway.

5056. Switches, Circuit Breakers, Motor Controllers and Fuses. a. Class II, Division 1. 1. Type Required

As a part of Interim Amendment No. 105, the final clause of this subsection has been revised by the addition shown below:

. . . shall be provided with *dust-ignition-proof* enclosures approved for Class II locations.

5057. Control Transformers and Resistors. a. Class II, Division 1

As a part of Interim Amendment No. 105, the last part of the first sentence has been revised as indicated below:

. . . shall have *dust-ignition-proof* enclosures approved for Class II locations.

5057. b. Class II, Division 2. 3. Resistors. As a part of Interim Amendment No. 105, "*dust-ignition-proof*" has been added as described for Section 5057a.

5058. Motors and Generators. a. Class II, Division 1

As a part of Interim Amendment No. 105, "*dust-ignition-proof*" has been added in this section as described for section 5057.a.

5058.b. Class II, Division 2. The last sentence of this subsection has been revised as indicated below:

Motors, generators, or other rotating electrical machinery of [protected] *partially enclosed* or splash-proof type shall not be installed in such locations.

This change was made because the term "protected" appears to be no longer used generally and the revised description will reduce the possibility of misunderstanding.

5060.a
5060.b.2
5061.a.1
5061.b.1
5063.a
5064.a.3

In each of these sections, the term "*dust-ignition-proof*" has been inserted as a part of Interim Amendment No. 105, putting to use the new definition of section 5051.

5076. Motors and Generators. c. Protected Type, Class III, Divisions 1 and 2

For the reason mentioned in connection with 5058.b. this subsection has been revised to read as given below:

Motors, generators, or other rotating electrical machinery of the [protected] *partially enclosed* or splash-proof type shall not be installed in Class III locations.

ARTICLE 510—SPECIFIC OCCUPANCIES

5120.c. Circuit Disconnects. This subsection has been revised as indicated below:

Each circuit [supplying equipment in or on a dispensing pump] *leading to or through a dispensing pump or island* shall be provided with a switch or other acceptable means to disconnect *simultaneously* all conductors of the circuit from the source of supply.

The change is for clarification and is correlated with Section 3801.

5135.d. Wiring and Equipment Above Hazardous Areas. An addition has been made in paragraph 3 as indicated by the words in italics below:

3. Ceiling suspended surgical and other lighting fixtures shall conform to paragraph b, Section 5019 of Article 500, *except that surface temperature limitations set forth in subparagraph b2 of that section shall not apply.*

5135.f.4. A revision has been made in the first sentence as follows:

In addition to all usual control and protective devices, the ungrounded system shall be provided with an approved ground contact indicator which will respond if any conductor of the system becomes grounded *through an impedance of 10,000 ohms or less* [and which will limit the leakage current under such conditions to 2 milliamperes] *and the arrangement shall be such that the leakage current under such conditions will not exceed 2 milliamperes.*

The change was made for clarification at the request of the Committee on Hospital Operating Rooms.

ARTICLE 520—THEATRES AND ASSEMBLY HALLS

5214. This is a new section reading as follows:

5214. Enclosing and Guarding Live Parts. *Live parts shall be enclosed or guarded to prevent accidental contact by persons and objects. All switches shall be of the externally operable type. Rheostats shall be placed in approved cases or cabinets which enclose all live parts, having only the operating handles exposed.*

This new section is identical with Section 5308 under Motion Picture Studios and was added largely for the protection of persons in television shows and the audiences participating in such shows.

ARTICLE 530—MOTION PICTURE STUDIOS AND SIMILAR LOCATIONS

5306. Lamps in Film Storage Vaults

Additions have been made as indicated in italics below:

Lamps in film storage vaults shall be rigid fixtures, equipped with vaportight globes *or vaportight fluorescent housing.* Lamps shall be controlled by a switch having a pole in each ungrounded conductor. This switch shall be located outside of the vault *and provided with a pilot light to indicate whether the switch is on or off.* This switch shall disconnect from all sources of supply all ungrounded conductors terminating in any outlet in the vault. No electric motors, heaters, portable lights or other portable electric equipment shall be located in the film storage vaults.

This revision corrects discrepancy with NFPA pamphlet No. 40, Film Storage Vaults.

ARTICLE 700—EMERGENCY SYSTEMS

7012. Storage Battery

As a further refinement of this section which had been revised by Interim Amendment No. 100 permitting lead batteries with sealed plastic jars, the last two sentences which had, in the 1953 edition, read:

Automobile type batteries shall not be used. Lead batteries of other than the sealed-glass-jar type should not be used.

are changed to read:

Batteries, whether of the acid or alkali type, shall be designed and constructed to meet the requirements of emergency service. If of the lead-acid type, this shall include low-gravity acid (1.20 to 1.22 sp.gr), relatively thick and rugged plates and separators, and a transparent jar.

7013. Generator Set

The revision of this Section in Interim Amendment No. 100, which had removed the last sentence, formerly reading:

Automobile type storage batteries, dry cell batteries, or lead batteries of other than the sealed-glass-jar type, should not be used for starting or ignition uses in engine-driven generators.

was confirmed but a cross-reference to the test and maintenance requirements of Section 7004 was added.

7061. Unit Equipments

Additions and changes have been made in the first paragraph as indicated below:

Where permitted by the authority having jurisdiction, in lieu of other methods specified elsewhere in this Article, individual unit equipments for emergency illumination shall consist of (a) a battery, (b) battery charging means when a storage battery is used, (c) one or more lamps, and (d) a relaying device arranged to energize the lamps automatically upon failure of the normal supply to the building. The batteries shall be of suitable rating and capacity to supply and maintain at not less than 91% of rated lamp voltage, the total lamp load associated with the unit for a period of at least ½ hour. *Storage batteries, whether of the acid or alkali type, shall be designed and constructed to meet the requirements of emergency service.* [Automobile-type batteries or lead batteries of other than the sealed glass-jar type should not be used.] *If of the lead-acid type, the storage battery shall have a transparent jar.*

This revision provides a further refinement of tentative Interim Amendment No. 100. It gives recognition to the plastic case battery and rules out the possible use of automobile-type storage batteries.

ARTICLE 730—OUTSIDE WIRING

7322. Spacings

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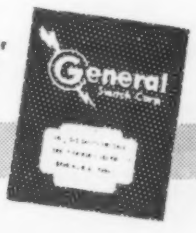

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b. Open Conductors Exposed to the Weather. The final sentence of this subsection has been revised by the addition of the words shown in italics below:

> In open spans, conductors shall be separated at least 12 inches from each other, *except for festoon lighting where conductors and lampholders shall conform to Section 7313 and Section 7361.*

This revision resulted from the fact that Interpretation No. 426 covering the previous wording had prohibited the general practice in use for festoon lighting.

7323. Clearance from Ground

This Section has been revised to refer to the National Electrical Safety Code for circuits of more than 600 volts. To accomplish this purpose, the introductory sentence and subsection a have been revised as follows:

> Open conductors *of not over 600 volts* shall be not less than 10 feet from the ground and shall conform to the following:
>
> **a. Over Driveways.** Conductors above alleys and above driveways on other than residential property shall have a clearance above ground of not less than 18 feet [and, if more than 600 volts, 20 feet], see Section 2324.

Subsections **b** and **c** have not been changed but at the end has been added:

> *For clearances of conductors of over 600 volts, see National Electrical Safety Code.*

7324. Clearance from Buildings

This section also has been revised so as to refer to the National Electrical Safety Code for clearance from conductors at over 600 volts. In the introductory sentence of the section, an addition has been made as indicated by italics:

> Conductors *of not over 600 volts* shall have a clearance from buildings as follows:

Subsection **b.2** has been changed:

> **2. [Less than 7500 Volts]. *Open Conductors.*** Open conductors [of less than 7500 volts between conductors] shall be at least three feet horizontally from buildings unless eight feet higher than the roof.

Subsection **b.3** has been deleted in its entirety. It formerly read:

> Open conductors of voltages between 7500 and 15,000 between conductors shall be kept at least 8 feet horizontally, and open conductors of more than 15,000 volts between conductors shall be kept at least 10 feet horizontally from all buildings except central stations, substations, and transformer vaults.

At the end of the section has been added the new statement:

> *For clearances of conductors of over 600 volts, see National Electrical Safety Code.*

ARTICLE 810—RADIO AND TELEVISION EQUIPMENT

8103. Community Television Antenna

This is a new section reading as follows:

> *The antenna shall comply with the requirements of this Article. The distribution system shall comply with Article 800.*

CHAPTER 9—CONSTRUCTION SPECIFICATIONS

93101.e. Conductor Construction. In the table opposite Type AVL, the designation of the outer covering has been revised to show merely "*lead-sheath*" whereas the former wording was "asbestos braid and lead sheath."

Also, the new silicone insulated fixture wires, Types SF-1, SF-2, SFF-1 and SFF-2 have been included in the table with their corresponding insulation and outer covering specifications. The inclusion of these types was originally part of Interim Amendment No. 103 effective August 17, 1955.

Also, the new heat-resistant type RHH has been added in the same portion of the table as type RH but with a footnote to show that for sizes 14-12 the insulation thickness is 3/64 inch.

93391. Underground Feeder and Branch Circuit Cable

This section has been changed by the substitution of "*4/0*" for "4" thus substantially increasing the range of sizes in which Type UF cable is recognized.

CHAPTER 10—TABLES, DIAGRAMS, EXAMPLES

Tables 1 and 2

In the heading for the second column of both tables, a horizontal line has been set under "RW" to show that the sizes (14-2) do not limit Types R and RW.

Also, in both tables, the heading now mentions "*copper,*" although this was always implicit under Sec. 1109.

Also, in both tables, in column 3, the following new type has been added:

Type RUH (14-2).

Also, the new Type RHH has been added to the tables. Being a 90 deg. C wire, most of the current values in the new column are the same as for Types TA, AVB, etc., but the ratings for the 3 smallest sizes, 14, 12 and 10, are identical with the current ratings assigned to the other rubber and thermoplastic types. This results from heating problems in equipment to which the wire may be terminated.

Tables 1 and 2. Note 2. Bare Conductors. This note has been revised as indicated below:

> If bare conductors are used with insulated conductors, their allowable current-carrying capacity shall be limited to that permitted for the insulated [conductor with which they are used] *conductors of the same size.*

Tables 1a and 2a. Allowable Current-carrying Capacities of Insulated Aluminum Conductors in Amperes

These are entirely new tables giving for aluminum the same information that Tables 1 and 2 continue to provide for copper conductors. These tables result from the study of a special technical subcommittee and represent carrying capacities of 78 per cent to 83 per cent, depending on the conductor size instead of 84 per cent as contained in the previous provision of Section 3106.

The note providing that the allowable current-carrying capacities for Types RH, RH-RW, RHW, and RHH aluminum conductors of a 3-wire, singlephase service and sub-service, shall be:

No. 2 —100 amperes
No. 1 —110 amperes
No. 0 —125 amperes
No. 00 —150 amperes
No. 000 —170 amperes
No. 0000—200 amperes

is also new and is in recognition of practice which has proved satisfactory and the lower average current per conductor in such installations.

Table 21. Full Load Currents in Amperes—Direct-Current Motors

Data on ¼ and ⅓ hp motors have been added and numerous changes have been made in the running currents for ½ hp to 3 hp sizes as indicated below (figures in brackets being deleted and those in italics added):

HP	115 V		230 V		550 V	
¼		*3*		*1.5*		
⅓		*3.8*		*1.9*		
½	[4.6]	*5.4*	[2.3]	*2.7*		
¾	[6.6]	*7.4*	[3.4]	*3.7*	[1.4]	*1.6*
1	[8.6]	*9.6*	[4.3]	*4.8*	[1.8]	*2.0*
1½	[12.6]	*13.2*	[6.3]	*6.6*	[2.6]	*2.7*
2	[16.4]	*17*	[8.2]	*8.5*	[3.4]	*3.6*
3	[24.]	*25*	[12.]	*12.5*	[5.0]	*5.2*

Table 22. Full Load Currents in Amperes* Single Phase Alternating Current Motors

As in the case of Table 21, the running current values assigned to several of the smaller sizes of motors have been revised upward. The explanation of these revisions is given in the following statement from the Motor and Generator Section of NEMA:

> The changes recommended are intended to bring the tables in line with full load currents of motors now being used and are not an attempt to establish new design levels. Under the pressure of economic forces, the material in 40 C open motors has been reduced so that the full load currents of these motors are greater than the values shown in these tables. Furthermore, the number of 50 C motors has increased until it now approaches 25 per cent of fractional horsepower production and these motors have full load currents from 10 to 30 per cent higher than the currents of 40 C motors.
>
> The production of fractional horsepower motors for driving ventilating fans is increasing rapidly and a large percentage of these motors are 1140 and 850 rpm motors which have full load currents about 25 per cent greater than the full load currents of 1725 rpm motors which have formerly been predominant. The Motor and Generator Section, therefore, believes that the new values of full load current are about right for 1725 rpm motors and a little low for the slower speed motors.

The changes made in the table are indicated below (figures in brackets being deleted and those in italics added):

HP	115 V		230 V	
⅙	[3.2]	*4.4*	[1.6]	*2.2*
¼	[4.6]	*5.8*	[2.3]	*2.9*
⅓		7.2		3.6
½	[7.4]	*9.8*	[3.7]	*4.9*
¾	[10.2]	*13.8*	[6.5]	*6.9*
1	[13.]	*16*	[6.5]	*8*
1½	[18.4]	*20*	[9.2]	*10*

In addition, some minor changes have been made in the fine-print notes under this table as indicated below:

> *These values of full-load current are for motors running at *usual* speeds [usual for belted motors] and motors with normal torque characteristics. Motors built for especially low speeds or high torques may [require more running current,] *have higher full load currents* in which case the nameplate current ratings should be used.

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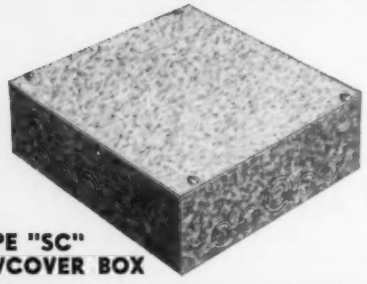

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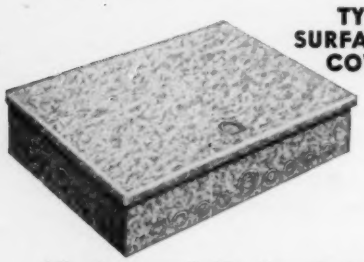
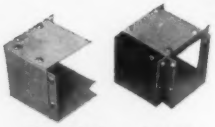


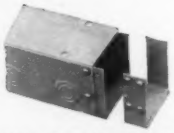
All sizes available for electrical cutouts, switches, relays, junction and pull box applications, galvanized or grey—with or without knockouts.

WIREWAYS and DUCT

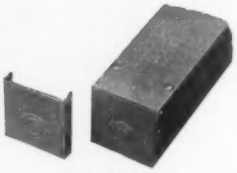
TYPE "SD" SCREW COVER AUXILIARY GUTTERS



ELBOW and TEE



"U" CONNECTOR



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2½ x 2½, 4 x 4, 6 x 6
1 to 5 foot lengths

ALL ASSOCIATED FITTINGS AVAILABLE

Steel Protection of Electric Conductors, plus Accessibility.

Economical to install and maintain — tapping, splicing, additions, inspections, may all be made within the limitations of the National Electrical Code.

Write for descriptive catalog containing installation data and price list.

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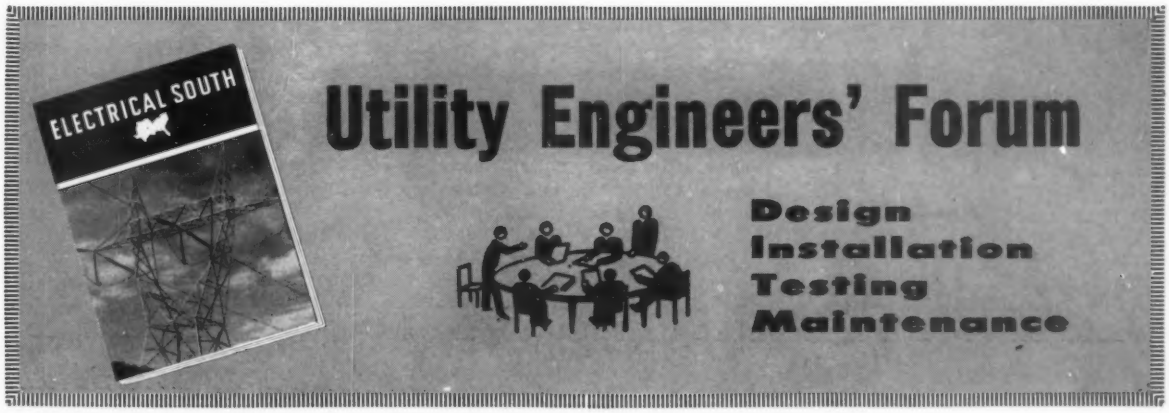

Texas distribution conference

This meeting, sponsored annually by the Department of Electrical Engineering of the University of Texas, has become the most important utility company engineering meeting in the Southwest. The 1956 conference was the ninth and certainly one of the best.

◆ THREE PANEL discussions featured the Ninth Annual Power Distribution Conference, held at the University of Texas, in Austin, under the direction of B. N. Gafford, professor of electrical engineering. These covered distribution system protective problems, experience in combating insulator contamination, and new approaches to underground residential distribution.

In addition to the panel discussions, there were talks on street lighting trends, ungrounded delta systems in industrial plants, coordination and relaying of industrial-utility company electrical interconnections, emergency loading of power transformers, and preventive maintenance of distribution equipment.

The discussion of street lighting trends was presented by K. Douglas Tobin, of the General Electric Company street lighting plant at Hendersonville, N. C.

Street lighting

Street lighting application problems received particular attention in Mr. Tobin's talk.

"The world around us is endless as far as new applications for outdoor lighting are concerned," he said. "We're all familiar with the standard type of roadway we find in our own community. The narrow, heavy foliaged residential streets which require careful examination by the lighting engineer to remove the tree interference but not the beauty of the trees—the traffic streets all too narrow and crowded for todays fast moving public—the secondary and main business sections with their wide streets, heavy vehicular and pedestrian traffic and their problems of outmoded lighting in many cases. There is a fantastic job to be done in all three of these areas in order to bring them up to date and provide well applied lighting for comfort and safety. Some of us are familiar too with the more knotty problems of bridges, viaducts, underpasses and traffic circles. But just around the corner in this industry is a host of problems not even associated with lighting a short time ago.

New problems evolving

"I refer particularly to the: (1) 60 mile-an-hour turnpikes and expressways with 3, 4, 6 or even 8 driving lanes in each direction. (2) The interchange problems associated with these complex highways requiring adequate lighting for fast moving vehicles and drowsy drivers to distinguish the proper routing. (3) The various "belts" around our larger cities, mostly built above the ground where the unusual kind of lighting application job is encountered. (4) The tunnels that are going under rivers, harbors, bays and mountains where more lighting is required during daylight than at night, a problem to tax the ingenuity of the most brilliant lighting application engineer. (5) Shopping centers with not only decorative lighting but a hundred acres for 10,000 cars and 30,000 people all to be pushed in and pulled out and not mar the shoppers' disposition for an instant.

"These are the problems of today, not tomorrow, but today. They are here with us now and we must do something about them for tomorrow's problems are as difficult as today's looked yesterday.

Not impossible job

"The job for the application or street lighting engineer is not as impossible as it might sound, however. With the new equipment now on the market, the developments now in the making, the techniques that are being perfected, the job isn't too dismal. In fact, it presents quite a challenge to the enterprising young engineer seeking a bright future. He has unlimited

latitude in respect to the amount of work he can take on, he has the equipment to do the job and he has the back up of unlimited facilities in the research and manufacturing area. Even though this business has been going on for half a century it is still in its infancy and it is up to us to make it into the man sized industry it should be and will be.

"There is one more point in this area of facilities available to the street lighting engineer that I would like to discuss with you. The society—which ties us all together, which gives us a common area to develop our collective thinking, which encourages and supports the research and study work of the industry and the group that searches out the desires of the industry and establishes the standards which we live by is the Illuminating Engineering Society. They have developed what is know in the industry as the American Standard Practice for Street and Highway Lighting —The ASA - IES Code. Every man having any association with these problems should have a copy of this Code and in addition should contribute his own thinking and experiences for the betterment of the Code. It is a very necessary part of any street lighting job as is the engineer who interprets the code. Use it to its best advantage and it can surely be a valuable aid to you."

Protective problems

Distribution system protective problems were discussed from both the utility company's viewpoint and that of the industrial plant.

B. M. Gallaher, of Texas Electric Service Co., Fort Worth, presented the viewpoint of the utilities, while the industrial plant viewpoint was presented by C. H. Lackey and J. E. Parker, both of Carbide and Carbon Chemicals Co., of Texas City, Texas.

Mr. Gallaher pointed out that higher voltage distribution had brought with it some additional protective problems.

"With higher voltage permitting longer circuits, circuit exposure jumped to many times that of 4-kv circuits," he said.

"Where, formerly, weatherproof wire had frequently been used for primaries and adequately prevented many short-circuits due to wind, trees and birds, the use of higher voltage made the use of conventional weatherproof insulation a hazard rather than a benefit. Birds and other small animals which were frequently killed by contact with 4-kv circuits, generally fell in the clear without causing a flashover. On 15-kv circuits, a similar contact results in a 60-cycle flashover which usually trips the circuit. A flashover started by lightning would be followed by a power-arc over longer distances on the higher distribution circuit. Burndowns on the insulated weatherproof wire were more prevalent due to the power current arc being confined to one spot on the conductor.

Fault currents higher

"Although short-circuit currents on 4-kv, 5000 kva substation at the bus might be in the order of 7,000 to 10,000 amperes, a mile of express feeder reduced the short-circuit current to values more in the order of 1500 to 2000 amperes. With the 15-kv circuits frequently connected to a generator bus, or large substation, fault currents have frequently been found (or calculated) to be in the order of 15,000 to 30,000 amperes.

"Consider, for a moment, the action of, say, 20,000 amperes (450 mva) on a #1/0 copper wire (the size frequently used on laterals). In 1/5 second the temperature is 350°, and in ½ second the conductor is fused. Before the conductor actually fuses, it is generally draped down in the secondary or in the street!

"Other factors resulting from excessively high short-circuit currents include: interrupting current ratings of transformer cutouts are exceeded, interrupting capacity of transformer internal fuse links is exceeded, and lack of ability of connectors and hot-line clamps to "take it" during short-circuits.

"The engineering solution to these problems has been a continuing challenge."

After discussing in detail how utility companies are meeting this challenge, Mr. Gallaher concluded his remarks by directing attention to the fact that his company's experience with service to all classes of customers indicates:

"A need for the development of a Standard of Service.

"Close cooperation with both manufacturers of equipment and industrial customers' engineers in order to take advantage of existing practices and facilities.

"Method of protection, sequence of breaker relaying, relay settings for proper coordination, should be freely discussed prior to the time when service is rendered in order that maximum advantage may be taken of hold-over relays, etc.

"Selective-breaker fuse coordination is the most feasible and economical means known to us at present to improve reliability for general use on 12.5-kv circuits."

Industrial viewpoint

In their discussion of the industrial plant's viewpoint of distribution protection, Messrs. Lackey and Parker presented the results of a questionnaire directed to 30 industrial plants—mostly chemical and petroleum. The following questions were asked:

"(1) What is your approximate power load?

"(2) What portion do you purchase from a utility?

"(3) What special facilities have been provided to minimize power interruption? Has the service been satisfactory—if not, why?

"(4) How is the coordination of relaying between your plant and the utility handled?

"(5) What length and frequency of outages can be tolerated, and still consider the service satisfactory?

"(6) If it were possible, what per cent increase in rate could you justify to double the reliability of your electric service?

"(7) What type processes are most affected by outages? Are these production problems or safety problems?

"The replies to these seven questions showed unexpected similarity to the problems in all industrial plants. The following is a consensus of these comments.

"(1) The average power varied from 1500 kw to 500,000 kw.

"(2) The per cent of power purchased from the local utility ranged from 0 to 100%. It was interesting to note that there were very few cases where the utility supplied about one-half of the power. In practically every case, they supplied either 80% or more, or 20% or less, indicating that one system or the other was considered the basic system, and the other just supplemental power.

"(3) Reliability of the supply from the utility was obtained through the use of either loop or dual feeders with automatic, selective relaying to clear the faulted line without disturbing the other line or the power supply to the plant.

"(4) The relay settings and coordination were accomplished by either a joint conference between the utility and the industrial plant, or by one establishing the preferred relaying, and the other reviewing the suggested settings. Then minor adjustments were made until the scheme was mutually satisfactory.

"(5) Practically all plants indicated that no power interruption could be tolerated, and still consider the system satisfactory. However, in one or two cases, they did indicate that up to as much as five minutes would not cause trouble. Where a short interruption could be tolerated, it was usually in the case of industrial plants where less than 20% of the total power was supplied by the utility.

"(6) None of the plants felt that they would be willing to pay an added premium for increased reliability of service. Most of them felt that their service had been satisfactory. It was suggested by a few that the present rates were high enough to warrant reliable service, and that instead of a premium, a penalty clause should be included for unreliability.

"(7) Practically all cases indicated that both production losses and difficulties, plus safety hazards, would exist if unscheduled power interruptions were incurred.

Voltage dips noted

"One other point brought out by several of the people was that while they had not had sufficient power interruptions to consider the service unsatisfactory, they had experienced occasional voltage dips. Apparently this was due to switching surges or storms in the vicinity and would cause them to lose some of their equipment, even though their power supply was never completely interrupted. Most of these plants have installed short-time delay relays on their trip circuits, especially on their more important equipment, to carry them over these voltage surges."

The speakers also reported that a relaying scheme is no better than its preventive maintenance and testing program.

"Routine tests," they said, "need to be made at quite frequent intervals—some as often as from one to three months, depending upon the importance of the service. However, the major calibration tests can usually be scheduled for periods more in the order of six months to two years—once a year being a quite common period. There is a decided feeling that too frequent testing may cause more harm from mistakes and inadvertent damage than the good that is accomplished.

"The tests vary from the overall or primary test, in which current is passed through the primary of the current transformer and the circuit breaker tripped by the relaying action, to just a visual check. A quite usual procedure would be to remove the relays from service, test and calibrate on a load box, and check the instrument transformers for continuity and grounds. The instrument transformer relay circuit is grounded at only one point so that the intentional ground can be lifted for this test. If feasible, the circuit breaker may be tripped by closing the relay contacts.

"However, even without going to any tests, partial or complete, a good preventive maintenance program should include a routine inspection and cleaning of contact points. This is especially important in industrial plants where the atmosphere can cause oxidation of the contacts or coating of the contacts with insulating dusts, or where fumes can coat these contacts if allowed to stand for long periods of disuse."

Ungrounded delta systems

H. B. Thacker, of Westinghouse Electric Corp., opened the second day's session with his comprehensive discussion of "Ungrounded Delta Systems in Industrial Plants." He expressed the view that where service continuity is of importance and can be measured in terms of dollars of lost production resulting from electrical outages, the ungrounded system, properly operated and maintained, can furnish a valuable added degree of service reliability.

Interconnections

The subject of coordination and relaying of industrial-utility company electrical interconnections is increasing in importance as industrial plants grow in size and number, J. M. McReynolds told the conference in his paper on this topic.

Mr. McReynolds, who is associated with Houston Lighting and Power Co., discussed coordination of design and relaying, describing his company's policy and experience in this respect. He put particular stress upon coordination of operation.

"Regardless of the degree of coordination obtained in engineering and design of an industrial—utility interconnection," he said, "satisfactory joint operation can be realized only with close cooperation of the operating departments. Many industrial plants do not maintain a staff of electrical operators or dispatchers and it is desirable that the utility, who has qualified personnel on 24 hour duty, take the initiative to coordinate joint operations. The following set of instructions have been prepared by the Houston Lighting & Power Company and are submitted to each industrial customer who is served through an industrial—utility interconnection:

"Coordination of operation"

"In order that we may continue to deliver service of high continuity, it is extremely important that we have immediate notice of any unusual service conditions and all switching operations on our 66 kv 132 kv transmission lines, and on our distribution circuits.

"We would appreciate your advising all your operating personnel of the importance of notifying our dispatcher of any operation or change in condition of any switching device connected to our system.

"All scheduled switching for maintenance or test purposes should first be cleared with the H L & P Company dispatcher and switching orders obtained from him. After the switching has been completed the dispatcher should be informed that the orders have been executed. Orders should also be obtained from the dispatcher to by pass or take out of service any switching device.

"Any unscheduled switching, either automatic or manual, which may be required under emergency conditions should be executed and reported to the dispatcher as soon as possible. If a breaker has operated it should be identified by number and the following information given:

"(1) Present position of breaker (open or closed)

"(2) Number of operations

"(3) Time of occurrence

"(4) What relay(s) caused operations

"(5) Cause of trouble, if known

"Reclosing of breakers or switching to alternate circuits following trip outs of breakers from relay actions will normally be done by

automatic reclosing relays. In stations where automatic reclosing is not installed or in emergencies where automatic reclosing is installed but fails to function properly, it will be permissible to close an OCB *one* time in an attempt to restore service. Repeated reclosing of an OCB on faulted equipment will result in unnecessary damage to equipment and possible additional outages of incoming lines.

"Our system dispatcher is responsible for the over-all operation of the system and the only way he can adequately perform his duties is to know the condition of all equipment connected to the system. Your continued cooperation in keeping him informed will greatly facilitate his work."

Insulator contamination

The experience of several companies was reviewed during the panel discussion of "Experiences and practices in combating insulator contamination."

A particularly interesting case study was presented by J. B. Coltharp, operations manager, Gulf States Utilities Co., at Beaumont, Texas. His discussion related to problems arising from wind borne salt spray on a 13.2 kv distribution line on the Texas Gulf Coast between Beaumont, Port Arthur, and Galveston.

Mr. Coltharp explained that sections of the line originally built of ACSR developed such corrosion that the lines were changed out to copper-clad conductors, and when these, too, developed corrosive blisters between the steel and copper cover, the lines were changed out again—this time to No. 4 BHD solid copper conductors.

"While the replacement of these first two types of conductor with the solid copper conductor remedied our corrosion problem with reference to the conductor," Mr. Coltharp reported, "it did not remedy a more stubborn and difficult problem, namely, a leakage current at the points of insulator supports, cutouts, and lightning arresters, as well as leakage over transformer bushings. The specific trouble consisted of pole and crossarm fires along with flash-overs and lockouts. At the time of lockouts, even though there were no pole or crossarm fires or other apparent failures, the line was hard or impossible to pick up with relays set very high due to extreme leakage currents.

"From a strictly operating and design point, it is of interest that a major part of any year this line would operate just about as any other line of this length, size, and type. The major difficulty, however, is experienced under special weather conditions that may prevail for several hours or for several days in the spring of some years. At these times of difficulties, there is a sustained south, or southwest wind of the 40 mile per hour class with gusts up to 45 miles per hour. It is a matter of record that these winds have blown all day long for as much as three days. Generally speaking, they are not sustained at night, but may blow continuously for 12 to 15 hours on successive days.

"We have been supplied with data from the U. S. Weather Bureau to the effect that such winds may range all the way across the Gulf of Mexico and, as measured by actual air-borne observation, this salt spray may be carried as high as 4000 ft. The U. S. Weather Bureau also advised that with winds much above 20 miles per hour there will be air-borne salt spray. Needless to say, the line and all the surrounding area are drenched and dripping with salt spray from the Gulf of Mexico. . .

"Frequently such weather conditions are not preceded by rain and there is little or no rain during such a period. Under this condition, since the poles and crossarms are not wetted uniformly, and since there are these very high leakage currents, pole and crossarm fires result. If the pole and crossarm fires do not create lockouts due to short circuits or ground faults, there will be flash-overs and lockouts due to excessive leakage current.

"Then as the breaker is closed to pick up the line, the leakage currents exceed what most fault currents would be and the line locks out. Then it is necessary to sectionalize the line and pick up the load portion by portion.

"To make bad matters still worse, FM radio communication becomes very difficult under these high wind and salt spray conditions making it difficult to talk sometimes to a vehicle in plain view, less than a mile away.

"Of course, washing the insulators was tried. This washing developed to be a rather futile gesture as the insulators would be covered by salt spray before the apparatus had covered more than a few spans. Washing could not be effective until the extreme and continuous high winds had died down and, other than for general annual preventive washing, such practice was abandoned.

"Since these difficult conditions did not show up every spring, we worried along with this situation for a number of years. As the load gradually grew and as these electric customers, as all others, gradually became more and more dependent upon electric service, and as the May, 1955, unfavorable weather conditions presented a very dificult situation that caused some of our customers to make sustained protests, we decided to see if we could make a positive approach to this problem.

What others are doing

"Our first effort was to collect data from other companies operating lines under what we assumed were similar conditions. We contacted the Galveston operating group, Central Power and Light Company in Corpus Christi, Louisiana Power and Light Company in New Orleans, the City of Los Angeles Department of Water and Power, and the Southern California Edison Company. All of these organizations were quite helpful and all of them supplied us with valuable data. . .

"As to dealing with leakage currents, the following have been tried or were under consideration:

"(1) Over-insulate the line insulators, transformers and cutouts.

"(2) Use special bowl-shaped insulators.

"(3) Bond insulator pins, phase to phase, but not to ground.

"(4) Wash insulators with high pressure spray.

"(5) Use leased apparatus to clean insulators by air blasting non-conducting fine white powder over the insulators.

"(6) Apply non-conducting paint to wood pins on lines up to 4 kv.

"(7) Tighten all hardware, especially tight.

"(8) Use oversized hardware washers.

"(9) Use spring washers to keep all hardware tight.

"Incidental to this problem, in connection with hardware corrosion, the following have been used or are under consideration.

"(1) Stainless steel hardware.

"(2) Bronze hardware.

"(3) Conventional galvanized

For more economical operation

Modernize electric distribution systems with SORGEL air-cooled transformers or substations

Increase feeder capacity and efficiency

by transmitting electric power at higher voltage to load center

The most practical type transformers to step down voltages at load centers are SORGEL dry-type transformers.

They can be installed in almost any convenient place inside of buildings, without fire-proof vaults or other enclosures. SORGEL transformers are of the highest quality, and require little or no maintenance. No liquid to check nor replenish; small and compact; easy and convenient to install; economical operation.

Increased efficiency

Because SORGEL transformers can be installed close to load centers, the result is shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Quiet operation

The sound level of SORGEL transformers is well below the established standards. This outstanding feature is appreciated where low sound levels are an important factor. For that reason they are particularly adaptable for any indoor installation.

Easy installation

Attached wall brackets or floor mounting base. No separate mounting brackets nor junction boxes to make or buy.

Substations

SORGEL transformers, either dry-type or Askarel-cooled, are incorporated in substations, complete with primary and secondary switchgear. They are procurable with any make of switchgear, and from any substation manufacturer.

Complete Line

¼ Kva to 2500 Kva single phase.
1 Kva to 3000 Kva 3-phase, 2-phase, and phase changing.
All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltage.

Also special transformers and D. C. saturable reactors

to control electric power accurately and efficiently for manufacturing processes.

SORGEL reactors are designed to meet your exact requirements. Let us know what your problems and requirements are, and we will submit our recommendations with complete information.

Our sales engineers in principal cities are also at your service.

SORGEL ELECTRIC CO., 835 West National Ave., Milwaukee 4, Wis.

40 years' experience in the development, manufacturing and application of transformers.

steel hardware painted with special paints.

Action taken

"In assimilating the data so obligingly supplied by several operating organizations from Louisiana to California, we came up with changes. Specifically, we did the following:

"(1) Went from insulator, equivalent Locke No. 88, to special bowl insulator, equivalent to OB 40965.

"(2) Used the flat or curved oversized 4 in. sq. washer where we would have normally used the 2 in. sq. washer.

"(3) Applied the spring washer to all points where nuts were used on pole top hardware.

"(4) Change from steel brace to wood brace.

"(5) Either change the transformer or transformer bushing from standard bushing to bushing with 17 in. leakage distance.

"(6) Change from the standard cutout equivalent to Kearney HDG-51 to specially insulator supported cutout Kearney HDG-151-8.

"While neither the conductor nor the guy wires are a specific part of this subject, it is of interest that we, as previously stated, changed the conductor to solid copper and we are painting the guy wire and rods from 6 in. below the ground line to head height with a neoprene base primer and paint.

"From the point of view of an engineer responsible for keeping this line in service, I am happy to report that the Spring of 1956 did not bring forth one of the several day periods of 40 mile an hour winds off the Gulf. Our company only rebuilt the first 12 miles or most exposed portion of this line.

"Therefore, professionally speaking, a test of how well we have mastered the air-borne sea water contaminants must await the caprices of the weather.

Dust experience

C. C. Bayley, of Central Power and Light Co., San Benito, Texas, related that his company's most severe insulator contamination is caused by dust and sand from the flats along the coast and from the spoil banks of the intercoastal canal.

"This dust and sand becomes so severe in the most windy months, that visibility becomes limited and one highway cautions motorists to drive carefully when sand is blowing.

"Here are some excerpts from an annual report made by the U. S. Weather Bureau observer at Port Isabel, Texas: total days of full sunshine, 212; high winds, 45; dust storms, 74; heavy fog, 6; months with most high winds, March and June with 16 days each (winds of 25 to 38 miles per hour); month with most dust storms, March with 11 days.

"Annual average relative humidity 69%. . .at 5:00 P.M. reading time. Highest recorded 99%. . .5:00 P.M. Lowest recorded 34%. Noon time averages will run approximately 45%. This is one of the main factors in the production of our dust storms.

"It stands to reason that this sand, or dust, must be reasonably dry to be so easily blown, but it seems to have a natural affinity for insulators, and will form a dense coating on the insulators in a very short time. This dry coating causes very little trouble during the day. We have noted that even though the wind continues to blow in the same direction and with the same velocity, the sand quits blowing in the late afternoon or early evening. We believe this is caused by a rise in humidity and the sand, with its heavy salt content, picks up enough moisture to become too wet to be picked up by the wind. Some time after the sand quits blowing we begin to get severe insulator leakage and crossarm burning.

"Further inland our principal troubles are caused by dust from cultivated fields. This, with our usually heavy dew, also causes a great deal of burning. But, when there is plenty of irrigation water, this source of trouble is at a minimum.

Remedies found

"The best remedy for our situation is to get good rains at the proper time. Since we have had little success at rainmaking, we decided to experiment with different sizes and shapes of insulators. We are still doing this to some extent. . ."We have about decided that the size and shape of the insulators have little to do with their ability to resist contamination. Leakage distance is our principal consideration in buying insulators to use in this area. Very little difference has been noted in the performance of different shaped insulators having the same leakage distance.

"In the worst contamination sections we have heavily over-insulated the principal feeders and bonded the pins. We are overinsulating all the primary lines in the area but only bonding the principal feeders. This also applies to all primary bushings on transformers, reclosers, capacitors, etc. We have settled on bushings with a 17-inch leakage distance. We have not yet started using cutouts with the higher leakage distance, and this is where we are now having a great deal of trouble.

"In addition to overinsulating it is sometimes necessary to wash the worst sections. Transformer installations are washed first in order to clear up the cutout trouble. Then the lighter insulated lines are washed, and finally the heavily insulated lines.

"I mentioned earlier that the sand blows until late afternoon. It is necessary to wait until the sand stops blowing before starting to wash. This means that we will be washing until several hours after dark. We use a ladder truck with a keystone ladder mount and wash from the ladder. The water is hauled in a trailer mounted tank upon which is mounted a small gasoline engine belted to a gear pump. Since we wash in residential and business areas as well as in the open, we necessarily use less pressure and a smaller volume of water than the larger substation washing rigs. Also, we do not use distilled water as is common when washing 69 kv and above. We use water from the city water system, or if it is closer, from irrigation canals."

"It is in washing that we notice a great difference in insulators. The fog type insulators wash easier and faster. They seem to break up the water stream much better."

Manufacturer's view

A comprehensive discussion of the insulator contamination problem was presented by A. D. Lantz, Jr., development engineer for Ohio Brass Co., Mansfield, Ohio. His paper entitled, "A review of the surface leakage problem," discussed cleaning methods and other protective measures.

In his conclusions, Mr. Lantz reported that "present day insulator designs perform well in the great majority of contamination conditions. However, the reader should recognize that no universal solution is available for the variety of abnormal leakage current conditions which may exist. Certain counter measures are partially effective in some applications and the individual user must determine

O.Z. pull boxes

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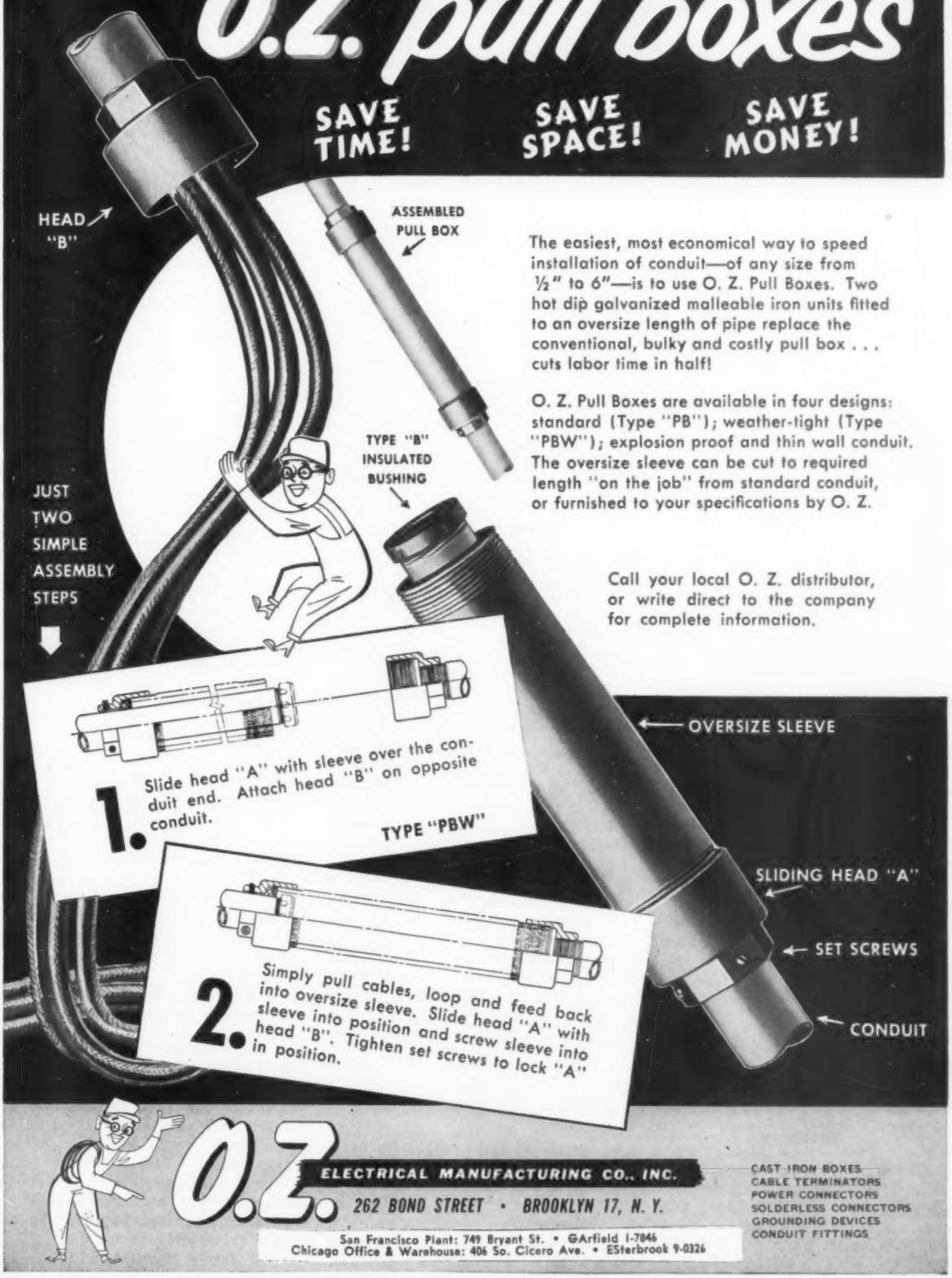

The easiest, most economical way to speed installation of conduit—of any size from ½" to 6"—is to use O. Z. Pull Boxes. Two hot dip galvanized malleable iron units fitted to an oversize length of pipe replace the conventional, bulky and costly pull box . . . cuts labor time in half!

O. Z. Pull Boxes are available in four designs: standard (Type "PB"); weather-tight (Type "PBW"); explosion proof and thin wall conduit. The oversize sleeve can be cut to required length "on the job" from standard conduit, or furnished to your specifications by O. Z.

Call your local O. Z. distributor, or write direct to the company for complete information.

1. Slide head "A" with sleeve over the conduit end. Attach head "B" on opposite conduit.

TYPE "PBW"

2. Simply pull cables, loop and feed back into oversize sleeve. Slide head "A" with sleeve into position and screw sleeve into head "B". Tighten set screws to lock "A" in position.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

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CAST IRON BOXES
CABLE TERMINATORS
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GROUNDING DEVICES
CONDUIT FITTINGS

which schemes offer the most promise and represent the best economic compromise.

"Over-insulation in areas subject to heavy contamination has demonstrated effectiveness. To give substantial benefit, the change in size or leakage distance must be gross, on the order of 2- or 3-to-1. Increases in leakage distance on the order of 25% to 30%, for instance, have generally not been of significant benefit. If over-insulation is adopted, standard design insulators are generally preferred because of availability, price, and ease of cleaning. In some cases, the over-insulation has taken the form of structure modification to strain position for local areas of extreme trouble. The strain position arrangement has the triple benefits of improved drip clearance, accessibility of all surfaces for natural cleaning, and the acquisition of sufficient space to allow radical changes in leakage distance or permit future adjustments.

"Selection of different styles of insulators such as smogtypes or fog-bowls may make significant alterations in the pattern of contamination deposit so that increasing intervals between cleaning may be possible.

"It is quite possible that our increased technology has produced not only increased contamination but also a beneficial surface coating in the person of silicone wax. The unquestionable benefits for the Barberton test site justify at least trial installations in other areas. If such trials are made, the insulator manufacturers will be most interested in collecting and summarizing the data.

"It does not appear that cleaning of one sort or other can be avoided for extreme applications. This might take the form of high pressure, hot-line washing or abrasive blast hot-line cleaning. A more expensive alternate would be hand cleaning in place. Even more expensive would be insulator replacement and complete ground cleaning, although this is done in frequent instances. Natural cleaning through selection of insulator designs which take advantage of this medium is frequently a good solution.

Summary

"Studies by countless investigators over three generations have demonstrated the futility of pursuing insulator contours or other radical design elements in order to develop an insulator which is immune to all leakage current difficulties. Nevertheless, some alleviation of difficulty can be gained by proper evaluation of each specific problem and the types of insulators best equipped to cope with the exposure. If a new or different style of insulator is suggested for a given application, the user should analyze the characteristics of his moisture, contamination, cleaning program, and other exposure features and determine whether the insulator being offered has much chance of improving over the style showing service difficulty. The thought that any change would be an improvement can quite frequently be incorrect.

"Even at best, insulators operating under quite adverse conditions will require cleaning. Here again, the necessity for hot-line cleaning or availability of un-energized cleaning opportunities plus the permanence of the various cleaning methods will influence the insulator choice.

"The test performance of silicone waxes seems to justify field trials."

Transformer loading

The third morning session of the conference was opened by J. B. Hodtum, of Allis-Chalmers Manufacturing Co., Pittsburgh Works, with a paper on "Emergency loading of power transformers."

Mr. Hodtum pointed out that the relation between temperature, time, and loss of transformer life as indicated by published data varies over a considerable range, and that a working group of the AIEE Transformer Committee is actively engaged in an investigation to establish, by test, a reasonable relation between life and temperature.

His paper explored a method for determining the hottest-spot copper temperature for various time-cycles and offered, as a suggestion, an estimate of the temperature-life characteristics. The final temperature-life characteristic should await the results of the AIEE investigation, he said.

Preventive maintenance

The subject of preventive maintenance of distribution equipment was discussed by L. H. Cardwell, of Dallas Power and Light Co.

"Preventive maintenance," he said, "under the pressure of system growth, has become a full time job instead of something to do during the slack-period. More and more scheduled maintenance jobs are giving way to more inspections and more testing to determine the specific need and to conserve manpower.

"The slack period customarily used to catch-up on maintenance has all but vanished and it has been necessary to carry out an increasing amount of maintenance work all through the year along with the construction of feeders and substations and connecting new customers. Naturally this has called for re-examination of past maintenance procedures, particularly jobs that had been done on a more or less routine basis for years, to see if they really needed to be done.

"As a result of this study a tentative maintenance plan is in operation based upon frequent field inspections to determine the specific need for maintenance, with records of performance and records of the results of the inspections. The inspection group issues written requests to carry out specific maintenance jobs. These requests provide a report back that the work has been completed.

"This has been a forced move; to get the job done it had to be broken down to pieces that could be worked along with new construction jobs. Some special maintenance jobs that could not be broken down were re-scheduled where practical.

Schedules revised

"For instance it was the practice at one time to overhaul network protectors annually. This schedule was examined and the experience of other companies was obtained. It appeared that it might be possible to extend this schedule to 2 or 3 years without too much trouble. Experience with the 3 year schedule has been such that now a 4 year schedule is being considered.

"Before the decision was made to increase the time between overhauls consideration was given to a study of the number and cause of protector failures experienced on the drop-out tests. This study showed the principal causes of failure to open were relay trouble and open circuit in the protector trip circuit. Failures from these causes would not be expected to increase with an increase in time between overhauls provided scheduled relay tests were continued.

"If the 4 year period between

Here's **MORE** Progress in Switchgear from Allis-Chalmers

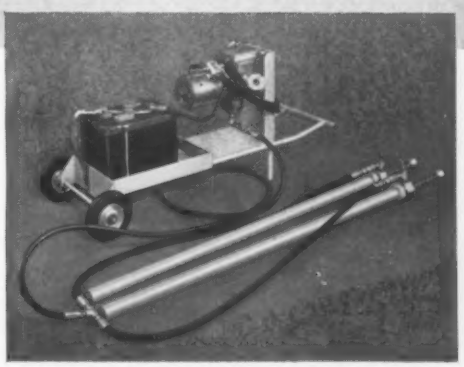
NOW Power-Operated Hydraulic Tank Lifter

Available for Allis-Chalmers intermediate breakers. Another example of Allis-Chalmers progress in simplifying maintenance while increasing safety. Costs no more than hand windlass type, yet cuts raising and lowering time by 80%.

Turning the needle valve completely controls operation and tank may be stopped in any position. Safe even if the hose or fittings are removed during operation.

Pressure energy is obtained from accumulator, power pump or hand pump of *Pneu-Draulic* system.

This is only one of many features of Allis-Chalmers all-new intermediate outdoor oil circuit breakers. Find out more by calling your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



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overhauls is tried as proposed, the results of the drop-out test will be watched carefully by the maintenance group for any effect on network protector performance. In this way it is expected that adverse results will be detected early and corrective measures will be taken accordingly."

Mr. Cardwell's paper included a comprehensive list of the preventive maintenance jobs that are being done in his company to avoid breakdowns in equipment.

Underground distribution

New approaches to underground residential distribution was the subject of the final panel discussion period which brought the 1956 conference to a close. One paper dealt with direct-burial transformers for residential distribution; another with direct-burial cable; and the third with practices and trends in servicing residential customers from underground distribution systems.

The paper on direct burial transformers was presented jointly by Prof. B. N. Gafford, of the University of Texas' Electrical Engineering Dept., and Robert A. Bell, design engineer, Electrical Service Co., a transformer manufacturing company in Greenville, Texas.

The authors described in detail the tests made on direct-burial transformers over a period of several months. With respect to heat flow, they found that at a boundary or radius of 30 inches the distribution of heat flow was as follows: to surface, 8.9%; downward, 13.7%; and to sides, 77.4%. The corresponding heat flow data at a radius of 90 inches from the transformer were: to surface, 16.3%; downward, 23.0%; and to sides, 60.7%.

The foregoing was based on data recorded in March. The authors pointed out that the tests showed that the downward flow of heat was 50% greater than the upward component, and that since the deeper earth is relatively more receptive to heat as the seasonal temperature increases it might be expected that a still greater portion of the heat will flow downward during warmer seasons and less during the cooler seasons.

The authors recommended:

(1) Tests be continued to determine the influence, if any, of the load of the previous year on heating and load capability.

(2) Typical residential load cycles be used in testing the transformer.

(3) Tests be correlated more closely with OA transformers. For example, use three transformers having identical coils and cores but enclose one in the burial case and two in conventional cases. One OA transformer should be pole mounted and the other placed in one of the typical transformer enclosures. Subject the three transformers simultaneously to identical loading conditions.

(4) Thermocouples be imbedded in the windings to eliminate the necessity of de-energizing the circuit while making resistance measurements.

(5) Depth of burial be considered from the standpoints of load capability and other economic aspects.

The authors concluded that on a basis of characteristic residential load curves, one of the transformer types tested may be loaded well above its rating during peak periods, and the other transformer type tested may be loaded slightly above its rating during peak periods.

Direct burial cable

W. J. Richard, of General Cable Corp., Perth Amboy, N. J., discussed direct-burial cable for residential distribution from many different aspects, including insulation, protective coverings, cable construction, and environmental effects.

With respect to general installation requirements, he said:

"The trouble free operation of buried cable depends largely upon the depth of burial and the protection provided against mechanical damage. These two factors are closely related. Burying cables deep in the ground is one of the most effective means of preventing mechanical damage. They should always be placed below the frost line to avoid mechanical stresses resulting from heaving or shifting of the earth caused by freezing and thawing. Also, they should be deep enough to be free from interference and possible damage from such operations as deep plowing, post hole digging, driven fence posts, road maintenance, drainage installations, and gardening.

"A good covering of earth to place the cables below the level at which such interference is likely to occur provides better assurance against mechanical damage than metallic armor on the cable itself in shallow ground. Armor cannot be depended upon for complete protection against damage by plows, sharp pointed digging tools, driven metal fence posts or to fully protect the cable against the effects of freezing and thawing. For good results, the depth of burial should be from 30 to 42 inches depending upon the location and the probability of mechanical disturbance. At this depth the cable is also less vulnerable to attack by insects and rodents.

"In addition to the natural protection of the earth coverage, it is highly desirable in some locations to provide further mechanical protection over the cables, such as creosoted wood planks or concrete slabs, after they have been covered with about six inches of backfill. Extra protection is of particular importance at road crossings and driveways, where damage could result from driving over the cables with heavy loads. For such locations the installation of the cable in buried conduit is highly recommended. In addition to the mechanical protection provided by the conduit, it also affords a convenient means of replacing the cable without the necessity of digging up the roadway.

Trench characteristics

"The condition of the trench and the type of backfill are of special importance. The most satisfactory way of installing buried cables is to lay them in a trench with proper bedding and backfill. The trench method, as compared with cables installed by means of a cable plow, results in less bending and distortion of the cable, less danger of stone cutting, greater uniformity in the depth of burial and better control of conditions throughout the entire length. Where cable is plowed in, there is no way of controlling the condition of the bedding and backfill since this depends entirely upon the contents of the soil. Also, there is no way to conveniently add mechanical protection over the cable such as creosoted planks and concrete slabs.

"Where cables are laid in a trench the bottom should be free of sharp stones and have a sandy loam layer at least three to four inches deep to provide a smooth bedding. The cable or cables can then be laid in the trench and properly spaced. Where more than one cable is installed in a single trench they should be spaced with three inches or more between the

(Continued on page 117)

"We back every Spang Conduit installation we make with a One-Year Unconditional Guarantee!"

says Mr. R. C. Jackson
Cahn Electric Co.
Shreveport, Louisiana

Billy E. Arnold unloads conduit which has been stored outside for several months. HD galvanized finish is highly resistant to corrosion, despite exposure to elements.

"That shows our confidence in SPANG Conduit. Of course, we expect it to last a lifetime. A *top-quality* conduit like SPANG means longer service life, fewer rejections, less installation time and more satisfied customers. That's why we use SPANG on 90% of our installations, and on many of our larger jobs requiring a carload or more we use it exclusively."

The new Shumpert Hospital installation

Cahn Electric has installed over 70,000 ft of SPANG HD Galvanized Conduit at the new Shumpert Hospital, Shreveport, Louisiana. This $10-million, 300-bed hospital will be completely furnished with the latest electrical equipment from an audio-visual nurses' call system to closed circuit TV in the cobalt treatment room . . . from the emergency power system to iron lungs. SPANG HD will give the hospital *top-quality* service.

"We were low bidder of six on the project," reports Mr. Jackson. We saved money by ordering SPANG Conduit in carload lots and storing it on location. The conduit was exposed to all the elements, but when we were ready to use the conduit several months later, we found it in excellent condition! Wire pulling was easy as ever, and no rejects!"

Let SPANG guard your reputation, too!

SPANG HD Conduit is easy to bend, thread and cut . . . is highly resistant to corrosion . . . offers years of *top-quality* service in any installation. Make SPANG HD your first choice every time. Your local SPANG Distributor is at your service.

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SPANG-CHALFANT
Division of The National Supply Company
GENERAL SALES OFFICE:
TWO GATEWAY CENTER, PITTSBURGH, PA.
District Offices and Sales Representatives in Principal Cities

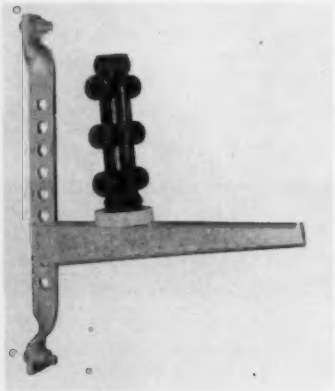
"Our fine reputation is our best advertisement," says Cahn Electric's R. C. Jackson. "And SPANG helps us maintain it." Cahn Electric has installed over 70,000 ft of SPANG HD Conduit in the New Shumpert Hospital, Shreveport, La., scheduled to open in mid-1957.

Notes on new utility equipment

New rack designed to support moles

T. J. COPE, INC., of Collegeville, Pa., announces the design of a rack to support moles. The rack was designed with the cooperation of Burndy Engineering Co., of Norwalk, Conn., manufacturers of the Burndy Mole, which is used frequently with underground distribution lines.

Cope's new rack will support both sizes of moles—1,500 ampere and



2,000 ampere and, if necessary, 3-phase circuits. A standard wall mounted rack has a horizontal arm with two types of porcelain supports. The circular type support is used where the mole is to be supported vertically.

The Burndy Mole can be positioned horizontally on the arm, as well as vertically. A semi-circular type of support is used for this horizontal position.

For additional data, ask for item U-101, using the coupon on page 12.

Power circuit breakers have higher ratings

ANTICIPATING three new higher industry-standard ratings for metal-clad switchgear, I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Philadelphia 30, Pa., has fully developed and tested power circuit breakers for all three ratings.

For 13.8 kv, 1200 and 2000 ampere applications, new units, designated 15hv-750, are now available with interrupting rating of 750 mva. These breakers, with their larger capacity, require no increase in stationary structure dimensions over those for 15hv circuit breakers rated 500 mva interrupting.

Added to the established line for 4.16kv applications, are circuit breakers, designated 5hv-350, having not only the higher interrupting rating of 350 mva but with continuous current rating of 3000 amperes for mains and bus ties or of 1200 amperes for feeders. The 1200 ampere, 5hv-350 stationary structure is 26" wide; the 3000 ampere, 5hv-350 is 36" wide; both are 90" high and of depth matching other 5hv switchgear.

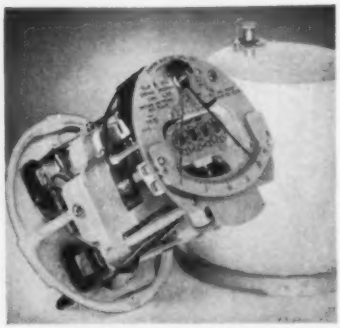
Also for 4.16kv, 1200 ampere applications, circuit breakers, designated 5hv-75 with the higher interrupting rating of 75 mva, are available and are interchangeable in stationary structures with present units rated 50 mva interrupting.

For additional data, ask for item U-102, using the coupon on page 12.

Two new "dual range" thermal demand meters

CONTINUING the trend in "extended range metering," Duncan Electric Mfg. Co., of Lafayette, Ind., announces two new "dual range" single-phase thermal demand meters. These meters have been designed to give users flexibility and convenience in demand measurement. The first, placed in production earlier this year, was the Type TF-SD single-phase 50-amp, 240-volt, 3-wire, 24/48 kw for metering loads up to 200 amperes. The newest is the Type TK 15-amp, 12/24 kw for loads up to 100 amperes.

Like the TF-SD, the new Type TK



is actually two meters in one. It affords a choice of scale capacity of either 12 kw or 24 kw. Thus, the meter may be matched to the load being measured. This is made possible by incorporating a range switch in the thermal circuit which interlocks with the demand scaleplate in such a manner that the electrical circuit is always connected correctly for either scale used. Changing the scale from 12 kw to 24 kw, or vice versa, is accomplished merely by removing three screws and turning over the scaleplate — one of the three screws being the "range switch."

From an economic standpoint, the dual range offered by this meter minimizes the user's investment in metering equipment, simplifies stocking of meters, and saves time in changing meters. In changing the range on a meter in the field, recalibrating is not necessary — the user may of course make a check if he prefers to do so.

For additional data, ask for item U-103, using the coupon on page 12.

Insulated crossarm guard with snap-action fastening

THE INSULATED crossarm guard, manufactured by the A. B. Chance Co. of Centralia, Mo., prevents contact between the tie wire and cross-

arm when hot-line ties are being made or removed.

Snap-action of the guard fastens it securely to the crossarm. Installed with a grip-all tool, the guard has a slotted end for sliding under pin-type insulators. Made of Formica, it is rated at 15 kv. It is designed for use on 3-3/4 x 4-3/4, or smaller, crossarms. Castings are made of aluminum; hardware, of steel.

For additional data, ask for item U-104, using the coupon on page 12.

New clamp provides maximum slip strength

A NEW CLAMP known as #2051, made of malleable iron with a reversible type keeper that can be reversed without removing the U-bolts, has been introduced by Porcelain Products, Inc., Parkersburg, W. Va.

design advantages

OF FISHER-PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

Any utility field man who has installed a Fisher-Pierce photoelectric control knows firsthand the many advantages of its clean, straightforward design. He appreciates, for example, time-saving plug-in installation of the one-piece electronic head; the ease, speed and safety with which he can handle compact F-P controls; the clean meter plate that has nothing to interfere with external wiring; the easily checked fuse. He knows the weatherproof glass enclosure design gives him quick, easy access to the control chassis; that he can orient an F-P control after mounting; and that component layout permits trouble-free servicing as well as maximum impulse strength. These advantages are important to the utility itself as well as the field man, since they mean rapid, low-cost installation and substantially reduced maintenance. Only F-P controls provide these advantages, *plus* these four other important features:

Series 64400

Series 63300C

COMPONENT QUALITY — Pre-aged, long life tubes • Wire wound potentiometer • Metal encased capacitors • Non-hygroscopic 1P39 phototube • Balanced armature Sigma sensitive relay.

PROTECTION — From surges and lightning, by linen-based bakelite sub-mounting chassis and proper component spacing Circuit and load fuses, and lightning arrestor • Fail-safe operation.

ADAPTABILITY — Three basic series and numerous models for all mounting requirements, operating voltages, load capacities and desired contact arrangements.

DEPENDABILITY — Proven by the thousands of F-P controls used by hundreds of utilities, over the past ten years.

Complete specifications and operating data are contained in informative F-P Bulletins, available on request. Or call the Fisher-Pierce sales representative in your area, for point-by-point proof of F-P superiority.

THE FISHER-PIERCE CO., INC.

59 Pearl Street, So. Braintree, Boston 85, Mass.

The reversal is done by simply backing off the nuts and reversing the keeper. The clamping range of this clamp is .20 to .50 inches and has a strength rating of 10,000 lbs. and weighs approximately 2.6 lbs. per clamp.

It has been designed for use on ACSR cables #4 through #1/0 in-

clusive and can be used on copper, copper-weld, or amerduct conductor. The design of this clamp is such that the ultimate in slip strength is attained and tests have proven that it will break the conductor prior to slippage.

This clamp is now available for immediate delivery and should fill a void that was very noticeable in the distribution clamp field.

For additional data, ask for item U-105, using the coupon on page 12.

Insulated bushing eliminates outages caused by animals

A NEW fully-insulated bushing is now standard equipment on transformers from Line Material Co., Milwaukee 1, Wis. The new bushing has been designed to eliminate outages caused by pets, birds, and wild ani-

mals contacting transformer bushing terminals. Increased safety to linemen is an inherent feature.

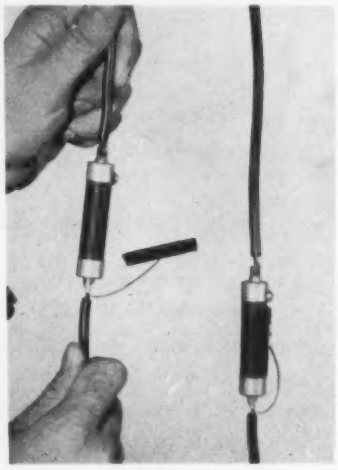
A phenolic cap covers all exposed live parts of the bushing. The cap has a drain to prevent water accumulation. On protected transformers a slot for lighting arrester terminal is included. An insulated knob, used to operate the terminal connector, will not spin out; yet it can be removed if necessary. A neoprene sleeve can be used on the high voltage riser to complete the insulation.

All L-M round wound single-phase pole-mounted transformers rated 5 kv, or more, up to 167 kva, are equipped with the new bushing. The new bushing is also standard on three-phase transformers up to 150 kva.

For additional data, ask for item U-106, using the coupon on page 12.

New "red flag" fuse indicates blown fuses

MAINTENANCE MEN will no longer have difficulty spotting blown fuses on pole-type secondary capacitors with the new "red flag" indicating



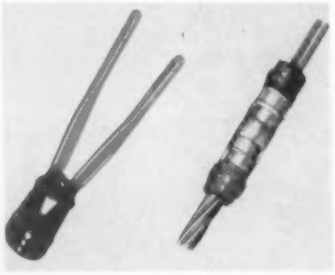
fuse, now standard equipment with secondary capacitors from General Electric Co., Schnectady, N. Y.

When the fuse blows, the red plastic flag pops up, and can be spotted readily from the ground. The fuse itself remains intact, an important safety feature because it eliminates the possibility of a free-swinging hot lead causing secondary faults. A four feet long insulated lead is supplied with the fuse.

For additional data, ask for item U-107, using the coupon on page 12.

New compression sleeve for service entrance connections

A NEW ITEM for the electric power industry has been added to the line of the Reliable Electric Co., 3145 Carroll Ave., Chicago, according to a recent announcement. This new product is the Reliable all-aluminum squeez sleeve (compression joint) for all combinations of conductors copper, aluminum and ACSR from size No. 10 through size No. 2. These heavy-wall compression sleeves are used for service entrance connections; they are coded by means of colored plastic caps over each end. Five clear colors denote the different sizes and there are fifteen different coded sleeves to provide the size and type conductor combinations. The plastic caps do not have to be removed as



the conductor punctures the plastic easily at time of installation.

In each compression sleeve is a solid center barrier that locates the conductor correctly. At the factory each section of the sleeve has injected an amount of grease that will correctly grease all strands within the sleeves upon compression. Each sleeve is clearly marked for size and the number of compressions.

For use with this new compression sleeve, Reliable is also offering a new No. 10-XPJ squeez tool. Three die grooves are combined in the one toggle tool which, according to Reliable, affords maximum versatility yet requires a minimum of space while working as well as on the truck. The No. 10-XPJ squeez tool is available either with handles coated with a bright orange vinyl plastisol which affords insulation should it be used for work on secondaries, or with handles painted a bright orange. The purpose of the bright color is to make the tool more visible wherever it may be and thus avoid loss.

For additional data, ask for item U-108, using the coupon on page 12.

Type "ATA" potheads for generator cable termination

TYPE "ATA" potheads for 200 pounds per square inch oil or gas

filled pipe type cables are now made in three conductor style for generator cable terminations by G&W Electric

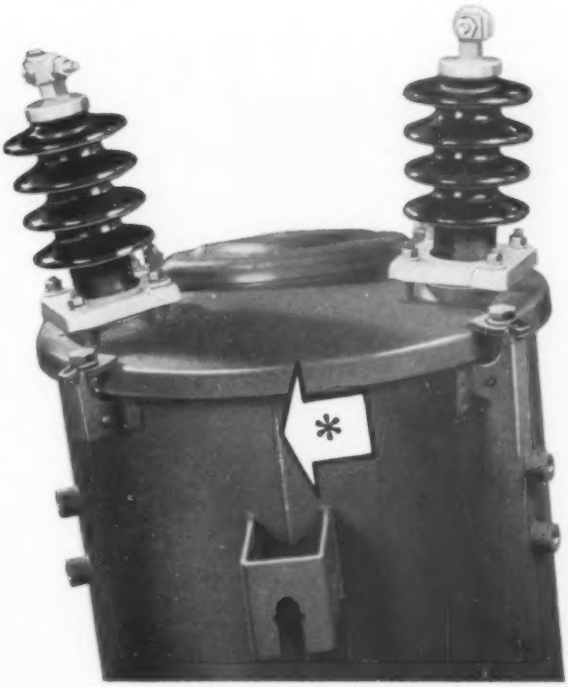
KUHLMAN "Salesman of the Week"

If you can identify this Kuhlman Electric Co. representative, and are the first one to notify Dept. SA-1, Kuhlman Electric Co., Bay City, Michigan, you will receive a valuable gift certificate. Each week a different Kuhlman representative is featured . . . watch for the Kuhlman salesman who calls on you.

"LET ME SHOW YOU WHY

KUHLMAN TRANSFORMER TANKS ARE YOUR BEST BUY . . . . . ."

In my territory a distribution transformer tank must be leak-proof . . . air-tight . . . and rigid in construction. That's why my customers consistently order Kuhlman. They know every weld and seam of a Kuhlman tank has been factory-tested, under pressure, for oil tightness. And for all around service, they prefer Kuhlman's solid construction—moisture-proof cover fitting—and rounded tank bottom features. It will pay you to talk to your local Kuhlman representative about all the features that make Kuhlman distribution transformers your best buy.



* All welds, seams PRESSURE-TESTED

SPUN-OVER RIM—increases tank rigidity. Forms a smooth gasket seat for a moisture-proof, air-tight cover fitting.

ROUNDED BOTTOM—provides added tank strength . . . sheds moisture easily . . . forms a rugged bearing surface for handling and shipping.

575a

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA

Specialty Co., 7780 Dante Ave., Chicago 19, Ill. The spreader head body part is welded non-magnetic stainless steel. No castings are used in contact with the high pressure oil or gas.

For additional data, ask for item U-109, using the coupon on page 12.

Tri-pulley stringing block eases cable installation

HENDRIX Wire & Cable Corp., 19 Watson St., Boston, Mass., announces the availability of a tri-pulley string-

ing block which makes installation of Hendrix aerial cables easy and saves time and money.

Only one climb is needed to install Hendri-Clamps and remove the tri-pulley stringing blocks. Blocks are positioned on messenger at thirty foot intervals with the three conductors in place as the conductors are being pulled in. All three conductors are easily and accurately sagged at one time while resting in the pulleys.

For additional data, ask for item U-110, using the coupon on page 12.

Extra high strength suspension insulator

DEVELOPMENT of a new extra-high strength suspension insulator is announced by P. R. Hartig, general

manager of the Insulator Department, General Electric Co., Baltimore, Md. To be known as the "XHS" suspension insulator, it is the second insulator design based on a new, stronger porcelain body developed by General Electric. The first of these was the "UHS" ultra-high strength 36,000 lb. insulator introduced earlier this year.

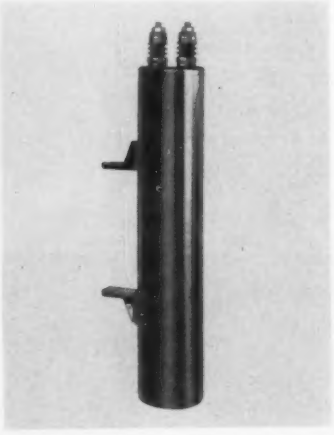
The XHS insulator is rated at 25,000 lbs. mechanical and electrical strength, though its dimensions are comparable to the ASA standard 15,000 lb. insulator. The advantages of the XHS insulator over the standard 25,000 lb. ball and socket insulator (ASA standard 52-5) include doubled impact strength, a 20% reduction in weight and choice of three spacing dimensions.

For additional data, ask for item U-111, using the coupon on page 12.

L-M adds 10-kvar secondary capacitor

NEW 10-kvar, single-phase 240-volt capacitors are being manufactured by Line Material Co., 700 W. Michigan St., Milwaukee 1, Wis. These units, designed for power factor correction on secondary distribution circuits, meet all NEMA standards. They have an over-all height of 29 1/16 inches and a diameter of 5 inches.

L-M's line of secondary capacitors now includes four units—3, 5, 7½,



and 10 kvar. All units offer the same features: solder-sealed bushings, two 48-inch insulated leads, and steel tanks protected from corrosion by aluminum metalized finish and an alkyd-resin paint. Terminal-mounted fuses, integral to the leads, are available when required.

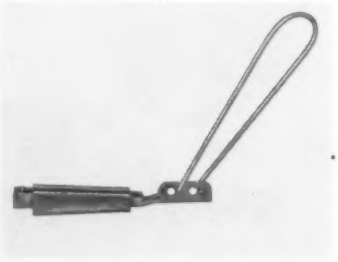
Units can be mounted with bushings up or down. A two-hole bracket is furnished for direct pole mounting, or an EEI-NEMA bracket is provided for crossarm mounting.

A unique shipping carton exposes bushing terminals immediately upon opening. Visual inspection of terminals and electrical tests can be performed without removing a capacitor unit from its carton.

For additional data, ask for item U-112, using the coupon on page 12.

New line widens range of service wedge clamps

ANNOUNCING a new intermediate line of service wedge clamps for the power industry, Reliable Electric Co., 3145 Carroll Ave., Chicago 12, Ill., has



increased its range of sizes and types to what is claimed to be the widest in the industry.

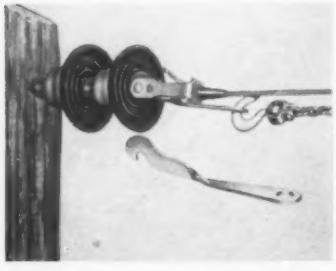
The new line is known as the 7090 Series and takes a range from .400 to .250. Two other series numbers are already in the Reliable line, the 7080 series takes a range from .260 to .160 and the 7082 series from .326 to .200. By adding the 7090 Series, Reliable believes that they can now supply the entire range of sizes needed for every power application.

For additional data, ask for item U-113, using the coupon on page 12.

New wire-puller hook for cutting dead-ends

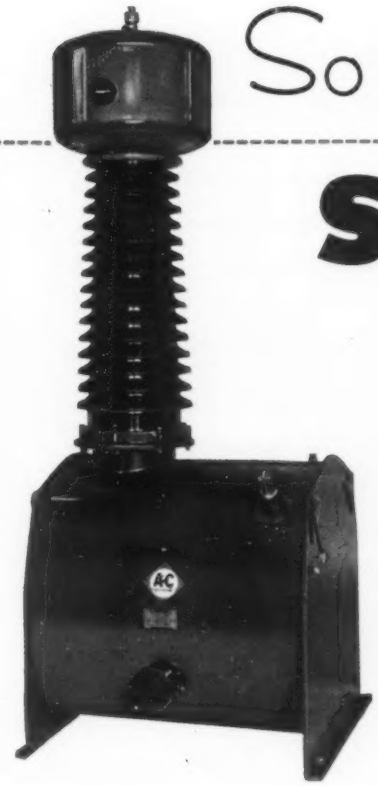
THE A. B. Chance Co., of Centralia, Mo., has announced a new tool for use in cutting dead-ends and pulling slack on automatic dead-ends.

The wire-puller hook holds the insulator and dead-end assembly directly in line with the conductor, eliminating the need to hold the insulators up with an insulator fork for inserting wire into the automatic



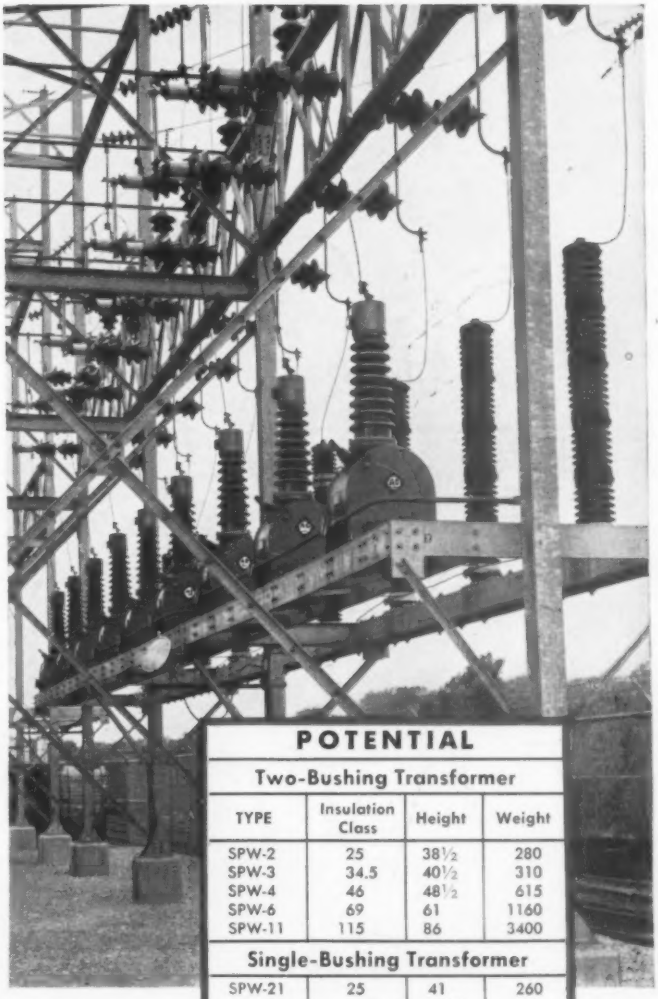
dead-end. A hook on one end of the tool hooks to the clevis bolt where the dead-end clevis on the dead-end attaches to the insulator. At the other end is a large eye for attaching blocks to pull the insulator string and dead-end body in line with the conductor to be dead-ended.

For additional data, ask for item U-114, using the coupon on page 12.



So Light...SO COMPACT

So *Easy* to Install



MUCH smaller and lighter than previous designs, new Allis-Chalmers potential transformers cut installation costs and provide maximum handling convenience. Less space and less foundation to mounting structure are required. A fork truck or block and tackle is all that is needed to lift these 69-kv units into position. And, of course, relocating is accomplished just as easily.

Performance has also been improved in both ratio and phase angle with the advanced design of Allis-Chalmers potential transformers.

Many other design features — features that assure unparalleled dependability and long life — have been incorporated in these modern units. Get the complete story from your local A-C representative or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

POTENTIAL

Two-Bushing Transformer

TYPE	Insulation Class	Height	Weight
SPW-2	25	38½	280
SPW-3	34.5	40½	310
SPW-4	46	48½	615
SPW-6	69	61	1160
SPW-11	115	86	3400

Single-Bushing Transformer

SPW-21	25	41	260
SPW-31	34.5	44¼	285
SPW-41	46	50¾	460
SPW-61	69	63¾	950
SPW-111	115	92	2310
SPW-131	138	112	3510

New Ratings have been added to the Allis-Chalmers line of potential transformers to include higher voltage insulation classes.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

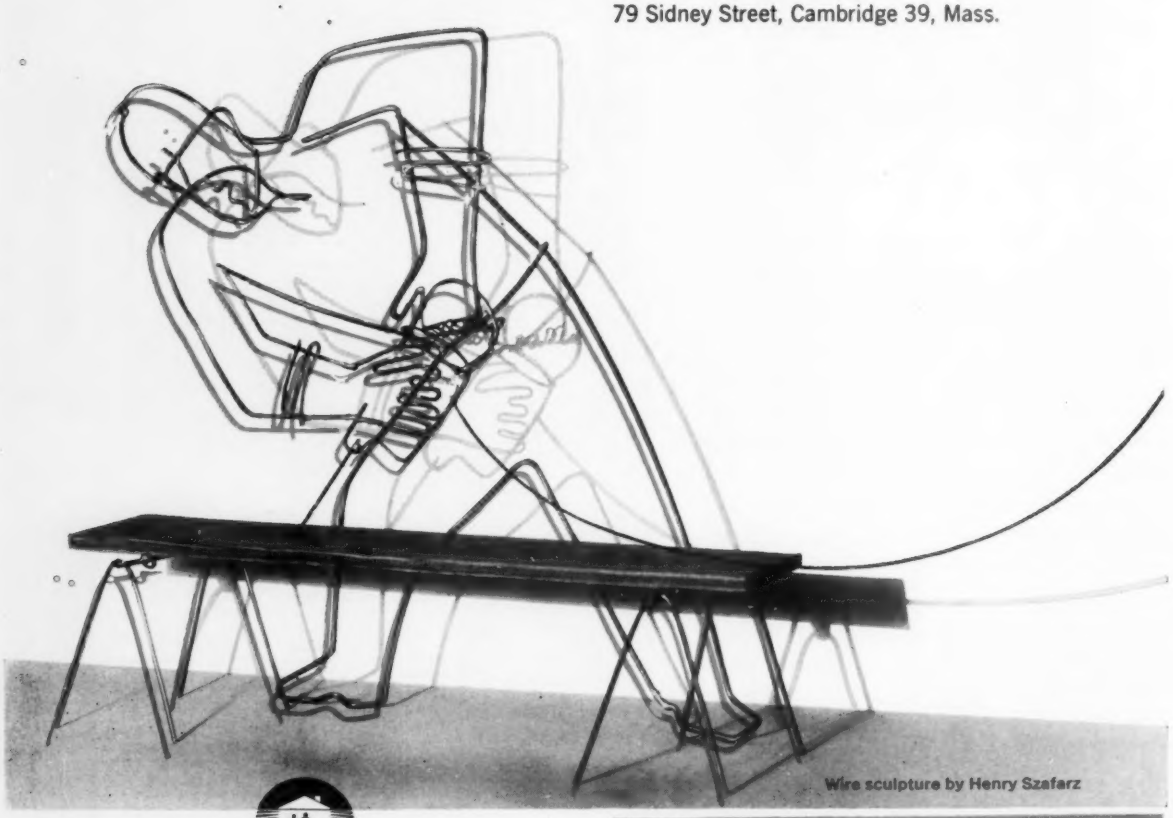
A-5164

"Week-end Wizard"

The spirit of do-it-yourself has made us a nation of handy men. At the same time, it has sharpened our appreciation of power tools and equipment: Simplex-TIREX cords and cables, for instance. These expertly engineered cords and cables are on the job everywhere: in home workshops, in factories, in mines, and on giant construction projects.

TIREX cords and cables, newly improved for greater flexibility, feature cured-in-lead Neoprene Armor that resists abrasion, oil, heat and water . . . gives longest service.

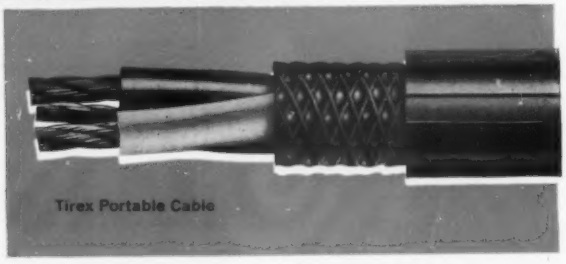
SIMPLEX WIRE & CABLE CO.,
79 Sidney Street, Cambridge 39, Mass.



Wire sculpture by Henry Szafarz

LIVE BETTER ELECTRICALLY

Simplex



Tirex Portable Cable

FOR BETTER ELECTRICAL INSTALLATIONS

5 NE WIDE RANGE CONNECTORS

are all you need

For Wire and Cable Sizes 14 AWG to 500 MCM

100% COPPER FOR CONDUCTIVITY

Entire Unit Cadmium plated—for copper, aluminum or steel conductors

LISTED BY UNDERWRITERS' LABORATORIES, INC.

Catalog Number	Cable Size Range	
	Minimum	Maximum
NE 35	14 Sol.	8 Str.
NE 60	8 Sol.	2 Str.
NE 100	2 Str.	1/0
NE 200	2/0	4/0
NE 400	250 MCM	500 MCM

- **Positive Grip Action**—Screw pressure on contact pad perfects pressure contact—is self-locking—increases "pull out" resistance.
- **Low Temperature Rise**—High pressure and wide contact area provide electrical conductivity greater than that of the maximum size wire or cable the connector will take.
- **Economical**—"Wide Range" provides for maximum usage, low inventory—completely salvable—one-piece assembly.

Write for our folder giving dimensional details, catalog numbers and other helpful information on National Electric "Wide Range" Connectors.

National Electric Products

NATIONAL ELECTRIC PRODUCTS NE WIRING SYSTEMS

PITTSBURGH, PA.
2 Plants • 11 Warehouses • 35 Sales Offices

News of the industry

edited for Southern readers

Fixtures, kw load up on average CL job

THERE ARE 14 per cent more fixtures and 25 per cent more kilowatt demand to the average Certified Lighting job than seven months ago, according to an analysis just issued by the National Lighting Bureau. As of March 31, 1956 the average Certified Lighting job had 42.7 fixtures and a 7.43 kw load. The jobs reported up to November 1, 1956 averaged 48.7 fixtures and 9.23 kilowatt load.

Of the eighteen Certified Lighting Bureaus operating in the United States, as of November 1st, twelve of them have reported the certification of 717 jobs with a total of 35,881 fixtures, having a 6,582.96 kilowatt load.

Insofar as the Southern bureaus are concerned, the Chattanooga Bureau reported ten jobs installed with an average of 68.8 fixtures per job and 9.87 kilowatt load per job; the Piedmont Bureau (Charlotte, N. C.) installed seven jobs with an average of 36.5 fixtures per job and 7.39 kilowatt load per job; and the New Orleans Bureau reported 34 jobs installed with 27.8 fixtures average per job and 4.84 kilowatt load average per job.

Wiring conference planned for Chicago

THE THIRTEENTH annual National Adequate Wiring Conference will be held in Chicago, February 21-22, 1957. The Sherman Hotel will be the headquarters for electrical contractors, distributors, manufacturers, utility personnel, and everyone in the electrical industry who is interested in promoting and selling more wiring to provide full Housepower in more homes.

The program will feature practical selling ideas that have worked, and the *LOOK* awards will again be presented.

New lighting sales group formed by Sylvania

A NEW, specialized sales organization for fluorescent lighting fixtures has been formed by the Lighting Division of Sylvania Electric Products Inc., according to an announcement by Garlan Morse, general sales manager of lighting products.

Richard G. Slauer, who was recently named fixtures sales manager for lighting products by Sylvania, has been placed in charge of the company's new sales organization for fluorescent fixtures.

The new sales group, which is separate from the company's existing lighting sales organization, is headed by Richard G. Slauer, who was recently named fixtures sales manager for lighting products. Reporting to Mr. Slauer are five area sales managers whose appointments were recently announced.

They are: C. J. Kelleher, northeast area, headquartered in Salem; Paul P. Harrison, southeast area, Atlanta, Ga.; Robert L. Kuschwa, central area, Chicago; John G. Felton, southwest area, Dallas, Tex., and Roger J. Delander, western area, San Francisco.

In announcing the new appointments, Mr. Morse said that "the tremendous expansion of the lighting business" was the main reason for the new organization.

He pointed out that "there is a recognized need for specialized training and experience in the ever-expanding diversity of lighting applications.

"We believe that we can render a better service to our distributors and customer-users by concentrating our field assistance on well-trained specialists," he continued. "Furthermore, this separation of lamp and fixtures sales will enable our present lighting sales organization to provide better service in our increasing lamp business."

In naming Mr. Slauer to head up the fixture sales group, Mr. Morse pointed out that he has had more than 30 years' experience in the lighting industry.

An engineering graduate of Stevens Institute of Technology, Mr. Slauer for four years was a commercial engineer, and for 14 years served in various engineering, sales and production posts for major lighting companies. He joined Sylvania in 1944 as manager of the lighting division applications laboratory here, and in 1955 was named sales manager of special products for the lighting division. He has assumed his new duties at the company's fixtures plant in Wheeling, W. Va.

Paul P. Harrison becomes southeast area sales manager, with office in Atlanta, for Sylvania's new fluorescent sales group.

Distributor conference conducted by Holophane

HOLOPHANE Co., Inc., recently held a two-day conference attended by 21 men representing 14 Holophane franchised distributors in the states of Georgia, Illinois, Indiana, Massachusetts, Michigan, New Jersey, New York, North Carolina, Oklahoma and Washington, D. C.

Covered in the two-day program, under the direction of C. C. Keller, vice-pres., and G. G. Rae, sales mgr., were new Holophane developments, studies of commercial, industrial and institutional lighting markets, and distributor-manufacturer relations.

Among those attending were G.

From a central power control point in Birmingham, Ala., Southern Services supervises the output of 25 generating plants like this one at Jordan Dam. Bell System teletypewriters speed the orders calculated on the "Early Bird" computer (inset).

How Bell System teletypewriter works with Southern's computer

Seated at the "Early Bird" computer in Birmingham, Ala., headquarters of Southern Services, Inc., the power co-ordinator transmits generating orders for 25 plants—by Bell System teletypewriter.

This close supervision contributes to more economical power supply to consumers in Alabama, Georgia, Mississippi, Florida. Power output, cost of power and transmission losses are figured continuously by the analogue computer. When load adjustments are necessary, Southern's co-ordinator sends the orders by private line teletypewriter.

Bell System service gives Southern speed, accuracy and dependability. And teletypewriter communications provide a day-to-day record of orders transmitted.

• • • •

Bell System private line service can make communications faster and more efficient for you. Call your Bell Telephone representative. He will be glad to study your needs.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER

CHANNELS FOR: DATA TRANSMISSION • TELEMETERING • REMOTE CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

Ray Owens, left, of Electric Supply & Equipment Co., Greensboro, N. C., and Fred Lawson, Lawson Electric Supply Co., Tulsa, Okla., hold lightweight Holophane Controlens, one of the new developments covered in the two-day distributor conference recently held by Holophane Co., Inc.

P. Babb, Jr., of Westinghouse Electric Supply Co., Atlanta; Fred Lawson and R. H. Bowyer of Lawson Electric Supply Co., Tulsa, Okla.; and R. Owens of Electric Supply & Equipment Co., Greensboro, N. C.

Adequate-wiring data prepared for local use

IN ITS CONTINUING campaign to help focus consumer attention on the need for adequate wiring, *Look* Magazine has prepared a comprehensive adequate-wiring promotion for the local use of members of the electrical industry.

In announcing that portfolios containing the promotion material are now available, Dick Harmel, merchandising manager of *Look*, pointed out that appliance dealers, electrical distributors, electrical contractors and utility companies can build a complete newspaper, radio and TV, direct mail and customer giveaway campaign from the adequate-wiring material *Look* has prepared.

The material includes ten 50-inch newspaper ads; ten 20-inch newspaper ads, and ten post-card size layouts that can be used either as small newspaper ads or printed as direct mailers. Also included are scripts for six radio and six TV commercials. Mats of the newspaper advertisements are available at nominal cost for those preferring not to make their own plates.

Because of the heavy demand by leading utility companies for reprints of *Look's* recent full-color editorial feature, "America's Great Wiring Mix-up" — which graphically depicted the need for adequate wiring — the portfolio also includes a full-color reprint of this feature for use in a window or counter display. For companies that want to use the reprints for such things as direct mailers, bill enclosures, payment office giveaways and customer giveaways, they are offered at $45.00 per thousand, f.o.b. New York.

Mr. Harmel added that contestants for *Look's* annual Adequate Wiring Awards, offered in 1957 for the third year in a row, will find the campaign material helpful in preparing the type of effective promotion that will put them in the running for top honors. A brochure describing the Awards contest, which closes February 3, is also included in the portfolio.

The adequate wiring portfolios may be obtained on request, by writing Robin Disston, assistant appliance merchandising manager, *Look*, 488 Madison Avenue, New York 22, N. Y.

Cameron & Barkley named Blackhawk distributor

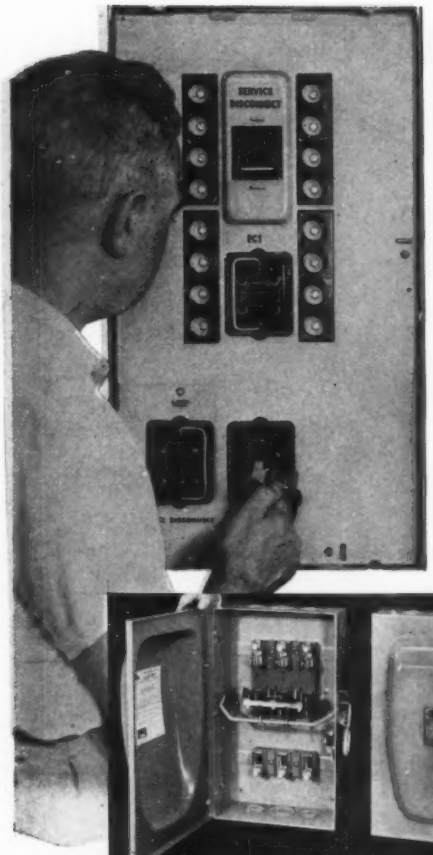
CAMERON & BARKLEY CO., distributor of industrial supplies, with branch offices at Charleston, S. C., Savannah, Ga., and Jacksonville, Orlando, Tampa and Miami, Fla., has been appointed a distributor for the Blackhawk Manufacturing Co., of Milwaukee, Wis., handling Blackhawk's line of hydraulic Porto-Power equipment.

The line includes hydraulic knock-out punches, thin-wall conduit benders, rigid pipe and conduit benders, and electrically driven hydraulic pumps.

Lighting firm conducts Atlanta lighting show

PRESCOLITE MFG. CORP., manufacturer of recessed incandescent and accent lighting with home offices in Berkeley, Calif. recently conducted a lighting show at the Atlanta Biltmore Hotel, Atlanta, Ga., in which they entertained Georgia architects, electrical engineers, contractors and distributors with cocktails and dinner. Charles L. Woodyard, of Charles Woodyard & Associates, the Atlanta representative for Prescolite, acted as host.

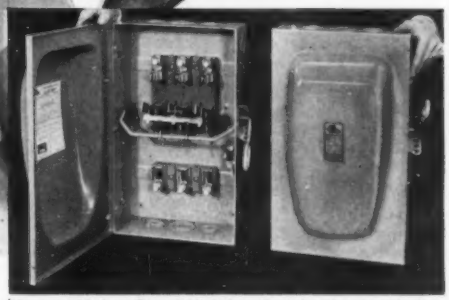
Pictured above at a recent Atlanta lighting show conducted by Prescolite Mfg. Corp., are, left to right, R. Berl Elder, consulting electrical engineer from Macon, Ga., Charles L. Woodyard, Prescolite's Atlanta representative and host for the show, Austin Little, national sales manager for Prescolite, and W. D. Runswick, Prescolite vice-president.



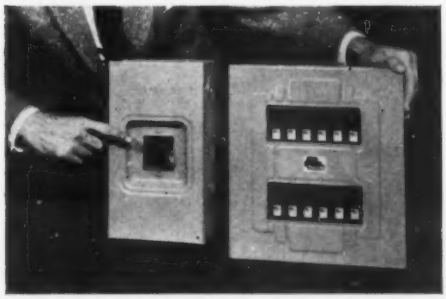
Murray "PC" combination pullout equipment has 100 Amp Magnetic-Hydraulic Circuit Breaker Main, 2 or 3 Power Circuits — 12, 16 or 20 plug fuse branch circuits.

working on 100 AMP jobs?

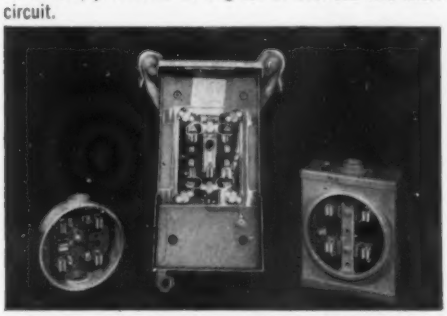
Save time and money—put up better installations by using one line throughout . . . MURRAY



Murray 100 Amp Type "G" Safety Switches have solderless lugs throughout, visible knife blade construction, generous wiring room and conveniently located clean cut KO's.



Fully magnetic 100 Amp Circuit Breaker Units carry full rated load, protect at all degrees of overload and short circuit.



A complete line of meter mounting equipment includes round sockets, shallow and standard troughs, medium and heavy duty devices.

With 100 Amp safety switch and circuit breaker mains, three different lines of combination pullout equipment, and a full line of meter mounting devices, Murray offers a wide, flexible selection of 100 Amp service equipment to meet all needs.

This means you can make complete 100 Amp installations using only one line throughout.

Consider the advantages: with matching knockouts on units for in-line placement and wiring, you can put up faster, neater installations. In addition, uniform styling and design in the Murray line gives you a better-looking installation plus consistently high quality throughout.

If you're getting your share of the booming modernization market, you'll find it much more profitable to install one line—Murray—on all your 100 Amp jobs. Your distributor has these devices now—next time you order, specify Murray.

Murray

"Quality doesn't cost ...it pays!"

Send today for your *free* copy of this new 12-page booklet. Gives helpful home wiring information plus complete details on Murray 100 Amp equipment. **MAIL COUPON NOW!**

Murray Manufacturing Corporation, Dept. ES-3
1250 Atlantic Ave., B'klyn 16, N. Y.

Gentlemen: *Please send me complete information on Murray 100 Amp equipment.*

NAME.....

POSITION.....

COMPANY.....

ADDRESS.....

CITY.....ZONE.....STATE.....

EFFECTIVE AD—A new form of outdoor advertising is being used by Martinez Baker Electric Co., Jacksonville. The signs, attached on the outside back of several city busses, are 7½" high by 60" long, have a 3-D effect, and are seen primarily by persons riding in cars in back of busses.

Atlanta representative announces new offices

HUGH SAUSSY CO., Atlanta electrical manufacturers' representative, announce new offices in Atlanta at 3230 Peachtree Road, N.E.

Brief news notes of manufacturers

J. L. MAUTHE, chairman of the board of The Youngstown Sheet and Tube Co., has announced that effective Jan. 1, 1957, its Continental Supply Company and Emsco Manufacturing Company divisions will be consolidated into one division to be known as Continental-Emsco Company.

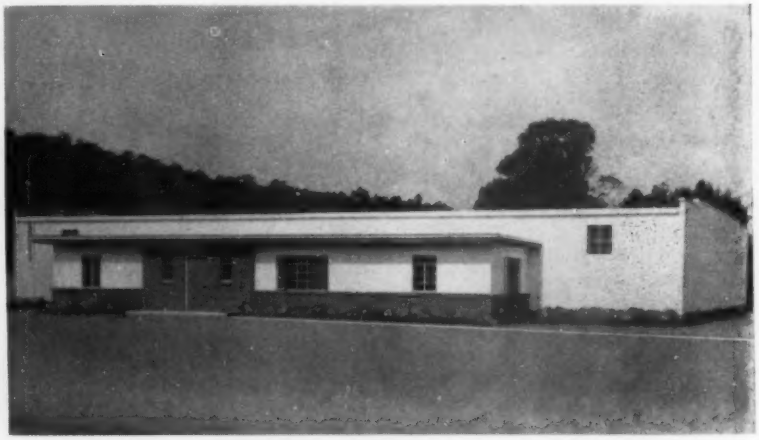
Fred M. Mayer, president of Continental and recently elected a vice-president of The Youngstown Sheet and Tube Co., will be president of the new division. General offices will be in Texas.

Everwarm occupies new quarters in Knoxville

EVERWARM, Inc., Knoxville, Tenn., has moved its plant from 2925 North Central Avenue to a newly completed building on Pleasant Ridge Road. Everwarm manufactures a well known line of radiant heating cable, electric wall-insert heaters, and portable electric heaters.

Everwarm, Inc., was organized in 1953 and is headed by W. Q. Gulley and R. W. Eempey, graduate chemical and electrical engineers. "Our new plant will give us added research, production and shipping facilities to develop more and better electrical products and better service to our customers", the owners said upon opening the new plant.

General and sales offices occupy some 1000 square feet of space at the front of the new masonry building. Production and warehouse floor space has been more than doubled and a concrete loading dock runs almost the full building length at the rear. Just off the loading dock is a motor-generator room which houses special ac-dc conversion generators necessary for the extrusion equipment.



Everwarm, Inc. has moved into this newly completed building on Pleasant Ridge Road in Knoxville, Tenn. The new plant, located on a three-acre tract, will provide room for additional research and expanded production and shipping facilities for the electrical heating manufacturer.

Dates Ahead

American Institute of Electrical Engineers, Winter Meeting, Hotel Statler, New York, N. Y., Jan. 21-25, 1957.

Southeastern Electrical Wholesalers Association, Seventh Annual "Industry Day" Meeting, Atlanta Biltmore Hotel, Atlanta, Ga., Jan. 24-25, 1957.

Missouri Valley Electric Assn., Industrial and Commercial Sales Conference, Hotel President, Kansas City, Mo., Jan. 31-Feb. 1, 1957.

National Association of Purchasing Agents, Public Utility Buyers' Group, 26th Annual Mid-Winter Conference, Brown Hotel, Louisville, Ky., Feb. 3-5, 1957.

Edison Electric Institute, Electric Space Heating & Air Conditioning Committee, St. Louis, Mo., February 6-8, 1957.

Air Conditioning, Ventilating and Electric Space Heating Exposition, Sheraton Park Hotel, Washington, D. C., Feb. 8-10, 1957.

The Electrical Trade Conference and Exposition, Shoreham Hotel, Washington, D. C., Feb. 12-14, 1957.

National Adequate Wiring Bureau, 13th Annual Conference, Sherman Hotel, Chicago, Ill., February 21-22, 1957.

Southern Safety Conference and Exposition, John Marshall Hotel, Richmond, Va., March 3-5, 1957.

Oklahoma Utilities Association, Annual Convention, Tulsa Hotel, Tulsa, Okla., March 28-29, 1957.

Southeastern Electric Exchange, 24th Annual Conference, Boca Raton Hotel & Club, Boca Raton, Fla., April 1-3, 1957.

Protective Relay Engineers, Tenth Annual Conference, A & M College of Texas, College Station, Texas, April 15-17, 1957.

FOR COMPLETE SATISFACTION AND SAFETY

APPLETON

INDUSTRY'S MOST ADVANCED LINE

EXPLOSION-PROOF EQUIPMENT

JUNCTION UNILETS

LIGHTING FIXTURES

RECEPTACLES

Explosion-proof electrical equipment is more important today than ever before. Manufacturers of material handling equipment are adding explosion-proof switches and connectors to be used in hazardous areas. And, an ever increasing number of industrial plants are almost entirely equipped with explosion-proof electrical equipment. Appleton's full line of explosion-proof electrical equipment is the result of extensive laboratory development and field tests, with your individual safety requirements in mind. Proven acceptance and use by leading companies the world over is your assurance that APPLETON is...

TODAY, MORE THAN EVER...

The Standard for Better Wiring®

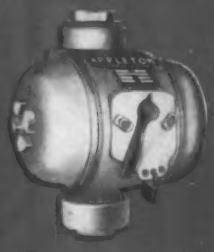
SWITCHES

LINE STARTER UNILETS

FLEXIBLE COUPLINGS

EXPANSION UNIONS

CIRCUIT BREAKER UNILETS



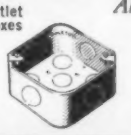
Sold Exclusively Through Selected Wholesalers

APPLETON ELECTRIC - PRODUCTS®

Also Manufacturers of

Industrial Lighting

Outlet Boxes



"ST" Series Connectors

Malleable Iron Unilets & Covers

Automatic Reelites

APPLETON ELECTRIC COMPANY 1754 Wellington Avenue • Chicago 13, Illinois

New, revised estimating tables continued in this issue

A NEW SERIES of estimating tables, completely revised in the light of more recent jobs and experience, are presented in this issue and will appear from month to month in forthcoming issues. These electrical estimating data sheets cover labor only and are arranged alphabetically with the basic material headings as a title for each tabulation.

Labor units given in these tabulations are based on a minimum of interference during work progress. The averages listed do not provide for abnormal job conditions, and any such abnormal conditions will require adjustments by the user, based on his experience.

The work units covered by each table are composed of one or more separate but closely related operations necessary for the complete installation of a particular basic item of electrical equipment. These operations associated with the basic material are described at the bottom of each table.

Most of the electrical estimating tabulations follow the same form. Column 1 at the left shows the size of the material to be installed. The second column from the left gives the time required to install the material, and it should be noted especially that this "productivity" column may be based on individual units or in the case of cable or conduit on units of 100 feet or 1,000 feet. The abbreviations "Ea." for each, "C" for hundreds, and "M" for thousands in Column 2 indicate the basis of the labor hours.

Columns 3 to 13, from the left, give the actual labor costs in dollars per unit of installation, at various hourly wage rates.

When calculations are being made for an hourly wage rate that doesn't correspond to any of the rates listed in Columns 3 to 13, the user may multiply the number of hours in Column 2 by 100 and this will give the labor cost based on an hourly wage rate of $1 per hour. By multiplying this by the hourly wage rate that actually applies in the user's locality, the exact labor cost of the operation may be obtained. Labor costs obtained in this way will be for units, hundreds of feet, etc., as given in heading of Column 2 of the table.

The labor units covered by the tables represent direct job labor costs and do not include delivery of material to site, engineering, estimating, or any other indirect cost.

As will be noted, some of the electrical estimating tabulations to be given will be for independent operations, such as excavating, backfilling, etc. These are included for use in preparing estimates on work of a special nature not covered under a specific table heading.

Tables will appear in alphabetical order.

LEAD SHEATHED CABLE (IN CONDUIT)
ONE CONDUCTOR

No. CABLES PULLED 3 & 4

CABLE SIZE	HOURS PER M FT.	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
12	6.7	.008	.01	.012	.013	.015	.017	.018	.02	.022	.025	.025
10	10.5	.013	.016	.018	.021	.024	.026	.029	.032	.034	.037	.039
8	12.2	.015	.018	.021	.024	.027	.031	.034	.037	.04	.043	.046
6	16.8	.021	.025	.029	.034	.038	.042	.046	.05	.055	.059	.063
4	21.5	.027	.032	.038	.043	.048	.054	.059	.065	.07	.075	.081
2	30.3	.038	.045	.053	.061	.068	.076	.085	.091	.098	.106	.114
1	33.4	.042	.05	.058	.067	.075	.084	.092	.10	.109	.117	.125
1/0	38.8	.049	.058	.068	.078	.088	.097	.107	.116	.126	.136	.146
2/0	44.2	.055	.066	.077	.088	.099	.111	.122	.133	.144	.155	.166
3/0	49.4	.062	.074	.086	.099	.111	.124	.136	.148	.161	.173	.185
4/0	57.8	.072	.087	.101	.116	.13	.145	.159	.173	.188	.202	.217
250 MCM	63.8	.08	.096	.112	.128	.144	.16	.175	.191	.207	.223	.239
300 "	71.7	.09	.108	.125	.143	.161	.179	.197	.215	.233	.251	.269
350 "	78.1	.098	.117	.137	.156	.176	.195	.215	.234	.254	.273	.293
400 "	84.4	.106	.127	.148	.169	.19	.211	.232	.255	.274	.295	.317
500 "	95.0	.119	.143	.166	.19	.214	.238	.261	.285	.309	.333	.356
600 "	103.8	.13	.156	.182	.208	.234	.26	.285	.311	.337	.363	.389
700 "	112.1	.14	.168	.196	.224	.252	.28	.308	.336	.364	.392	.42
750 "	115.9	.145	.174	.203	.232	.261	.29	.319	.348	.377	.406	.435
800 "	119.9	.15	.18	.21	.24	.27	.30	.33	.36	.39	.42	.45
900 "	126.1	.158	.189	.221	.252	.284	.315	.347	.378	.41	.441	.473
1000 "	132.0	.165	.198	.231	.264	.297	.33	.363	.396	.429	.462	.495

E-101-B

LABOR: Includes preparation time, installing pull wire on runs of 75 ft. and under, setting up reels, pulling cable. (Does not include making up joints, racking in underground vaults or installing fittings at ends of cables larger than No. 2.)

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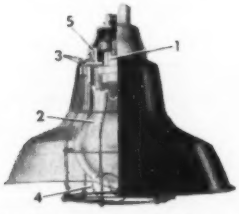

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		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
12	7.4	.009	.011	.013	.015	.017	.019	.02	.022	.024	.026	.028
10	11.6	.015	.017	.02	.023	.026	.029	.032	.035	.038	.041	.044
8	13.6	.017	.02	.024	.027	.031	.034	.037	.041	.044	.048	.051
6	19.0	.024	.029	.033	.038	.043	.048	.052	.057	.062	.067	.071
4	24.4	.031	.037	.043	.049	.055	.061	.067	.073	.079	.085	.092
2	34.8	.044	.052	.061	.07	.078	.087	.096	.104	.113	.122	.131
1	38.8	.049	.058	.068	.078	.088	.097	.107	.116	.126	.136	.146
1/0	45.4	.057	.068	.079	.091	.102	.114	.125	.136	.148	.159	.17
2/0	52.1	.065	.078	.091	.104	.117	.13	.143	.156	.169	.182	.195
3/0	58.7	.073	.088	.103	.117	.132	.147	.161	.176	.191	.205	.22
4/0	69.3	.087	.104	.121	.139	.156	.173	.191	.208	.225	.243	.26
NO. CABLES PULLED 3 & 4												
12	8.1	.01	.012	.014	.016	.018	.02	.022	.024	.026	.028	.03
10	12.8	.016	.019	.022	.026	.029	.032	.035	.038	.042	.045	.048
8	15.0	.019	.023	.026	.03	.034	.038	.041	.045	.049	.053	.056
6	20.9	.026	.031	.037	.042	.047	.052	.057	.063	.068	.073	.078
4	26.8	.034	.04	.047	.054	.06	.067	.074	.08	.087	.094	.101
2	38.3	.048	.057	.067	.077	.086	.096	.105	.115	.124	.134	.144
1	42.7	.053	.064	.075	.085	.096	.107	.117	.128	.139	.149	.160
1/0	49.9	.062	.075	.087	.10	.112	.125	.137	.15	.162	.175	.187
2/0	57.3	.072	.086	.10	.115	.129	.143	.158	.172	.186	.201	.215
3/0	64.6	.081	.097	.113	.129	.145	.162	.178	.194	.21	.226	.242
4/0	76.2	.095	.114	.133	.152	.171	.191	.21	.229	.248	.267	.286

E-102-B

LABOR: INCLUDES PREPARATION TIME, INSTALLING PULL WIRE ON RUNS OF 75 FT. AND UNDER, SETTING UP REELS, PULLING CABLE. (DOES NOT INCLUDE MAKING JOINTS, RACKING IN UNDERGROUND VAULTS OR INSTALLING FITTINGS AT ENDS OF CABLES LARGER THAN NO.2)

1-57

LEAD SHEATHED CABLE (IN CONDUIT)
THREE CONDUCTOR

NO. CABLES PULLED, 1-2

CABLE SIZE	HOURS PER M FT.	LABOR COST INSTALLED PER FT. AT FOLLOWING RATES										
		$1.25	$1.50	$1.75	$2.00	$2.25	$2.50	$2.75	$3.00	$3.25	$3.50	$3.75
12	6.8	.009	.01	.012	.014	.015	.017	.019	.02	.022	.024	.026
10	10.8	.014	.016	.019	.022	.024	.027	.03	.032	.035	.038	.041
8	12.5	.016	.019	.022	.025	.028	.031	.034	.038	.041	.044	.047
6	17.7	.022	.027	.031	.035	.04	.044	.048	.053	.058	.062	.066
4	22.8	.029	.034	.04	.046	.051	.057	.063	.068	.074	.08	.086
2	32.4	.041	.049	.057	.065	.073	.081	.089	.097	.105	.113	.122
1	36.1	.045	.054	.063	.072	.081	.09	.099	.108	.117	.126	.135
1/0	42.3	.053	.063	.074	.085	.095	.106	.116	.127	.137	.148	.159
2/0	48.5	.061	.073	.085	.097	.109	.121	.133	.146	.158	.17	.182
3/0	54.6	.068	.082	.096	.109	.123	.137	.15	.164	.177	.191	.205
4/0	64.4	.081	.097	.113	.129	.145	.161	.177	.193	.209	.225	.242
250 MCM	71.7	.09	.108	.125	.143	.161	.179	.197	.215	.233	.251	.269
300 "	81.3	.102	.122	.142	.163	.183	.203	.224	.244	.264	.285	.305
350 "	89.2	.112	.134	.156	.178	.201	.223	.245	.268	.29	.312	.335
400 "	97.1	.121	.146	.17	.194	.218	.243	.267	.291	.316	.34	.364
500 "	110.2	.138	.165	.193	.22	.248	.276	.303	.331	.358	.386	.413

E-101-B

LABOR: Includes preparation time, installing pull wire on runs of 75 ft. and under, setting up reels, pulling cable. (Does not include making up joints, racking in underground vaults or installing fittings at ends of cables larger than No. 2.)

1-57

Electrical Estimating—III

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Electronic measurements

Published by Polytechnic Institute of Brooklyn, 99 Livingston St., Brooklyn, N. Y., Edited by Moe Wind, 879 pages, 600 illustrations. Price, $15.00 set.

An authoritative handbook of electronic measurements, designed to fill the critical need for concise and complete sources of information in the field of electrical engineering has been published by the Microwave Research Institute of the Polytechnic Institute of Brooklyn.

Edited by Moe Wind, Research Assistant Professor of Electrical Engineering, the handbook was prepared under the sponsorship of the General Engineering Laboratory of the Rome Air Development Center, Griffiss Air Force Base, Rome, N. Y.

Written in eighteen chapters by seventeen authorities eminent in the field for their work on the topics assigned to them, the handbook is in two volumes totaling 879 pages. More than 600 photographs, tables and charts are included in the work.

The "Handbook of Electronic Measurements" offers up-to-date, conveniently collated information on electronic measurements and combines basic exposition with practical information. It presents a compendium of measurement methods, categorized according to frequency, from d-c through the microwave region. Complete descriptions and illustrations of necessary equipment are given and orders of accuracy and physical magnitude indicated.

Fact Finder

Published by Electric Companies Public Information Program, 2 West 45th St., New York 36, N. Y., 168 pages, $5.00.

The Electric Companies Public Information Program has published a new and completely revised edition of the industry Fact Finder.

The Fact Finder is a handbook of facts, figures and background information about the electric utility industry in the United States. The 168-page handbook is intended for use within the industry and by editors, writers, teachers, speakers, research specialists, students and others seeking up-to-date, accurate information.

The 1956 Fact Finder covers the industry's history, current developments and future plans, government and cooperative projects, national power policy, public opinion about the industry, and a region-by-region review. Also included are notes and selected references.

Test equipment

By Milton S. Kiver, Published by Howard W. Sams & Co., 2201 E. 46th St., Indianapolis 5, Ind., 192 pages, $2.75.

Servicing and Calibrating Test Equipment shows the service technician how to keep his test instruments in reliable working order. It tells how to determine their proper operation, how to avoid erroneous indications; explains typical calibration procedures; gives a method for performance record-keeping. Also covered are the most frequently used equipment.

Chapter subjects include: Pitfalls to Avoid When Using Test Equipment; Simple Ways to Check Instrument Accuracy; Keeping Instrument Operational Records; Preventative Maintenance Measures; and How to Service Your Test Equipment.

The Art and Science of Protective Relaying

By C. Russell Mason, Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y., 410 pages, 244 illustrations, $12.00.

In recent years, many new types of relays and much new knowledge have been accumulated. About the only up-to-date material available for training purposes was from publications of manufacturers. This material assumed advanced knowledge of the subject and was applicable principally to the particular manufacturer's products. Training in the subject usually could be gained only with a manufacturer or a power company. Mr. Mason's book now provides a comprehensive treatment which assumes only a knowledge of the fundamental principles of electrical engineering.

Experience has shown that a good grounding in protective relaying is a most valuable asset to the engineer who is going to continue in the electric power field. It is considered important enough that it is included in the Power Systems Engineering Course which the General Electric Company gives annually to selected men in the electric utility industry. This book provides you with this grounding in a single volume, as well as serving as a "refresher" source for those already familiar with the subject.

This book is one of a series written by General Electric authors for the advancement of engineering practice. Russell Mason is an application engineer with the G-E Apparatus Sales Division.

Reference Data for Radio Engineers

Published by International Telephone and Telegraph Corp., Publication Dept., 67 Broad St., New York 4, N. Y., Fourth Edition, 1121 pages, 1000 illustrations, $6.00.

A Fourth edition of Reference Data for Radio Engineers has just been released. In it, the contents of the previous volume were brought up to date, expanded where developments required further treatment, and new material added on such important subjects as modern network design of filters, magnetic amplifiers, feedback control systems, semiconductors and transistors, scattering matrixes, digital computors, nuclear physics, information theory, and probability and statistics.

As indicated by its title, it is primarily a compilation of equations, graphs, tables, and similar data that are frequently needed in general radio engineering and in college instruction. Prepared by engineers who are specialists in the numerous subjects covered in the book, it is intensely practical and compact and constitutes a convenient single source of data not previously gathered together in one volume.

Reference Data for Radio Engineers sells for $6.00 per copy and for $4.80 per copy in lots of 12 or more to a single address.

Office lighting guide

Published by Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y., 32 pages, $.50.

A new "IES Recommended Practice for Office Lighting," just released by the Illuminating Engineering Society, is the first report on this important lighting subject since 1947. Prepared by the Society's Committee on Office Lighting, the new report includes results of consultation over the past six years with representa-

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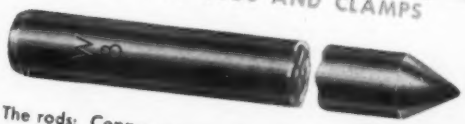

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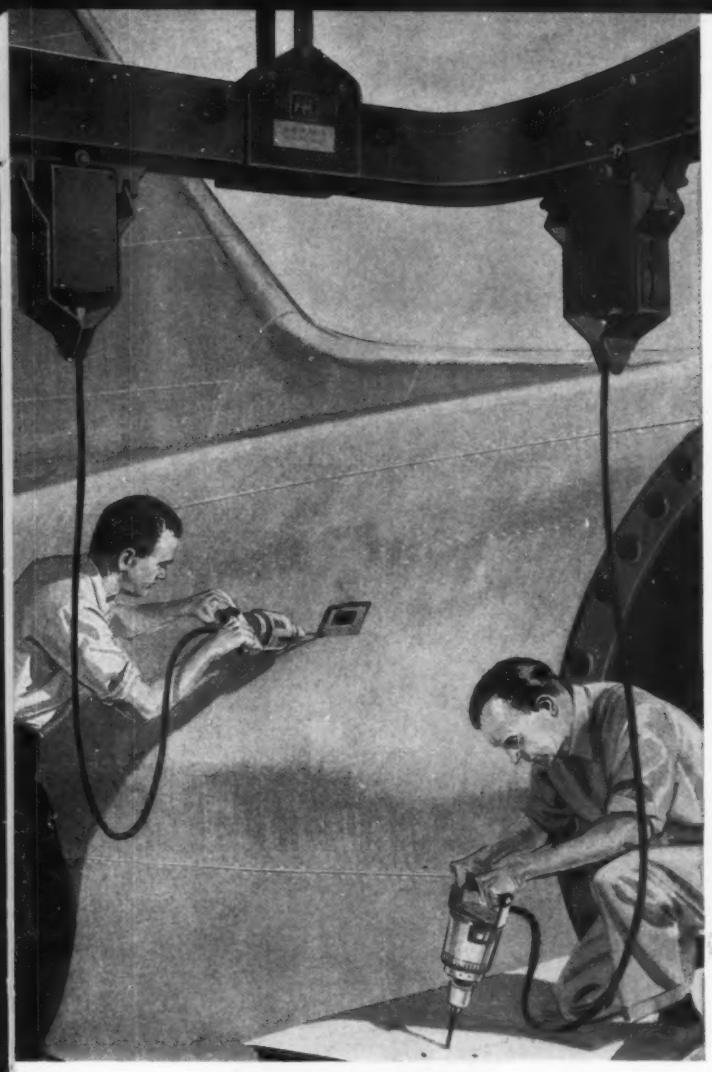

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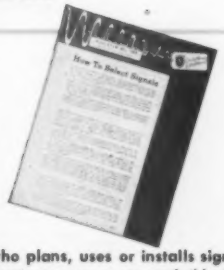

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tives of the IES Committee on School Lighting; the American Institute of Architects; and the National Council for Schoolhouse Construction.

The new IES Recommended Practice is 32 pages in length, completely illustrated, and with much of the valuable information arranged in tabular form for easy reference, making it an excellent manual for anyone concerned with the problem of office lighting.

Based upon the concept of lighting for specific tasks, the new "IES Recommended Practice for Office Lighting" introduces the subject with a general description of office operations, in which the eyes are used at close range for severe visual tasks. These include reading duplicated material, handwriting, pencilled stenographic notes, typing and fine print. "The visibility of such work is often poor and more attention should be devoted to its improvement," says the Committee, recommending specific preferred type sizes, paper finishes, ink, etc. in this opening section.

The following two sections of the new office lighting guide cover Influence of Lighting on Seeing and Influence of Environmental Factors. In these two sections are discussed the quantity and quality of illumination; recommended illumination levels, with table of levels for seeing tasks in 18 typical office departments; glare, including a table of acceptable brightness limitations, and a detailed discussion of reflectances as to finish and color of ceilings, walls, furniture, office machines and equipment, and floors. Of particular importance and value are the final sections which deal with lighting systems and specific areas.

Sections 5 and 6 of the new IES Recommended Practice for Office Lighting" are: Lighting Systems for Office areas, covering daylighting as well as every known type of electric lighting system; and Lighting and Seeing in Specific Areas, which recommends and illustrates along with text the most desirable type of lighting for each area and task, from private offices on through filing rooms, mail rooms, corridors and stairways. Maintenance is thoroughly covered, including specific plans for cleaning and relamping, together with a sample expense analysis worksheet.

The new office lighting guide is especially valuable for architects and consulting engineers, building and electrical contractors, building owners, managers and maintenance people, office management, in short, anyone to whom new or improved office lighting is a problem. Individual copies of this new booklet may be obtained from Publications Office, Illuminating Engineering Society.

WHEN HE SAYS CLIFTON
I know he uses the best Conduit made.

More and more architects, contractors and designers are specifying CLIFTON Conduit. The real fact is this — CLIFTON is thoroughly dependable, there is none better made. I standardized on CLIFTON a number of years ago and stopped switching. It made my jobs go faster because CLIFTON Conduit is always uniformly high quality. Believe me, nothing equals the uniform protective coating of zinc inside and outside, as applied by CLIFTON'S special "hot-dip" method.

Clifton Rigid Conduit

Remember this — a CLIFTON raceway installation permits easy rewiring, should it be necessary to accommodate the ever increasing demands of electrical loads, as emphasized by the national adequate wiring program. In this regard, CLIFTON Flexible Steel Conduit is especially easy to install and allows flexibility in your installations.

Clifton E.M.T.

Here is my suggestion. Standardize on CLIFTON Conduit. Get all the extra value that CLIFTON puts into their Rigid, E.M.T. and Flexible Steel Conduit, and in addition insure the integrity and easy flexibility of all your jobs. *CLIFTON Rigid and E.M.T. Conduit are approved by Underwriters' Laboratories, Inc., conforms with Federal Specifications WW-C-581C, WW-T-806B; and ASA Specifications C-80.1 — 1953, C-80.3 — 1953.*

Your Best 2 Word Specification

CLIFTON CONDUIT

Other* CLIFTON *Quality Products:

CLIFTON Plastic Covered Steel Conduit
CLIFTON Armored Cable
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CONDUIT CORPORATION

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WIRE — CABLE — RIGID CONDUIT — ELECTRIC METALLIC TUBING — CLIFTALL UF

Again in '57...

CHELSEA IS EASIER TO SELL THAN TO SELL AGAINST!

Deluxe Chelsea Fans

PACKED WITH FEATURES CONSUMERS DEMAND

PRICED FOR *MORE* PROFITS TO YOU

Again in '57 the Chelsea line will have the models, the prices, the features and the styling that makes customers out of prospects! . . . The line will include window fans. "box" type portable fans, floor fans and roll-a-bouts . . . Each is highly styled for maximum appeal with every feature customers demand, sizes to suit all home needs and for every purse. . . . Chelsea's unconditional guarantee covers every unit. . . . Get all the facts and see how the Chelsea line can increase store traffic and swell your profits for '57!

Plus... National and local advertising and Chelsea's famous "10 Point" promotional program that delivers everything you'll need to sell!

CHELSEA

FAN & BLOWER CO., INC.

PLAINFIELD, NEW JERSEY

More than 30 years service to the ventilating industry

News about people

John J. McDonough, executive vice president of **Georgia Power Co.,** has been elected president of the company at a meeting of the board

John J. McDonough

of directors. **J. M. Oliver,** vice-president and general manager, was elected executive vice-president. Mr. Oliver will continue to exercise general supervision over the operations of the company in addition to serving as executive vice-president. Mr. McDonough and Mr. Oliver were also elected to the board.

J. M. Oliver

Mr. McDonough succeeds **Harllee Branch, Jr.,** who was elected president of **The Southern Company** recently. Mr. Branch was elected a vice-president of the Georgia Power Company and will continue as a director. The changes became effective January 1.

A native of Savannah, Mr. McDonough joined a predecessor of the Georgia Power Company shortly after his graduation from Georgia Tech in 1923. His first job was as assistant to the manager of the Georgia Southern Power Company in Dublin. Between 1927 and 1937 he filled various supervisory and managerial posts in Dublin, Athens, Brunswick, Douglas, Augusta and

For cost conscious engineers...

Unique adaptability of Sangamo Type R Current Transformer encourages simple, economical installations

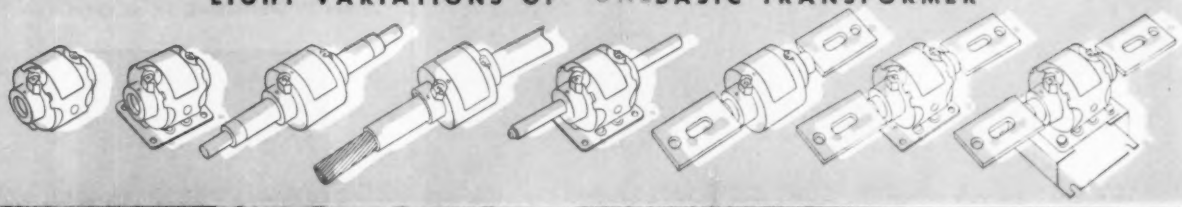
Use this Sangamo (Type R) Current Transformer as a bar-primary-type, a window-type, with or without an auxiliary mounting plate.

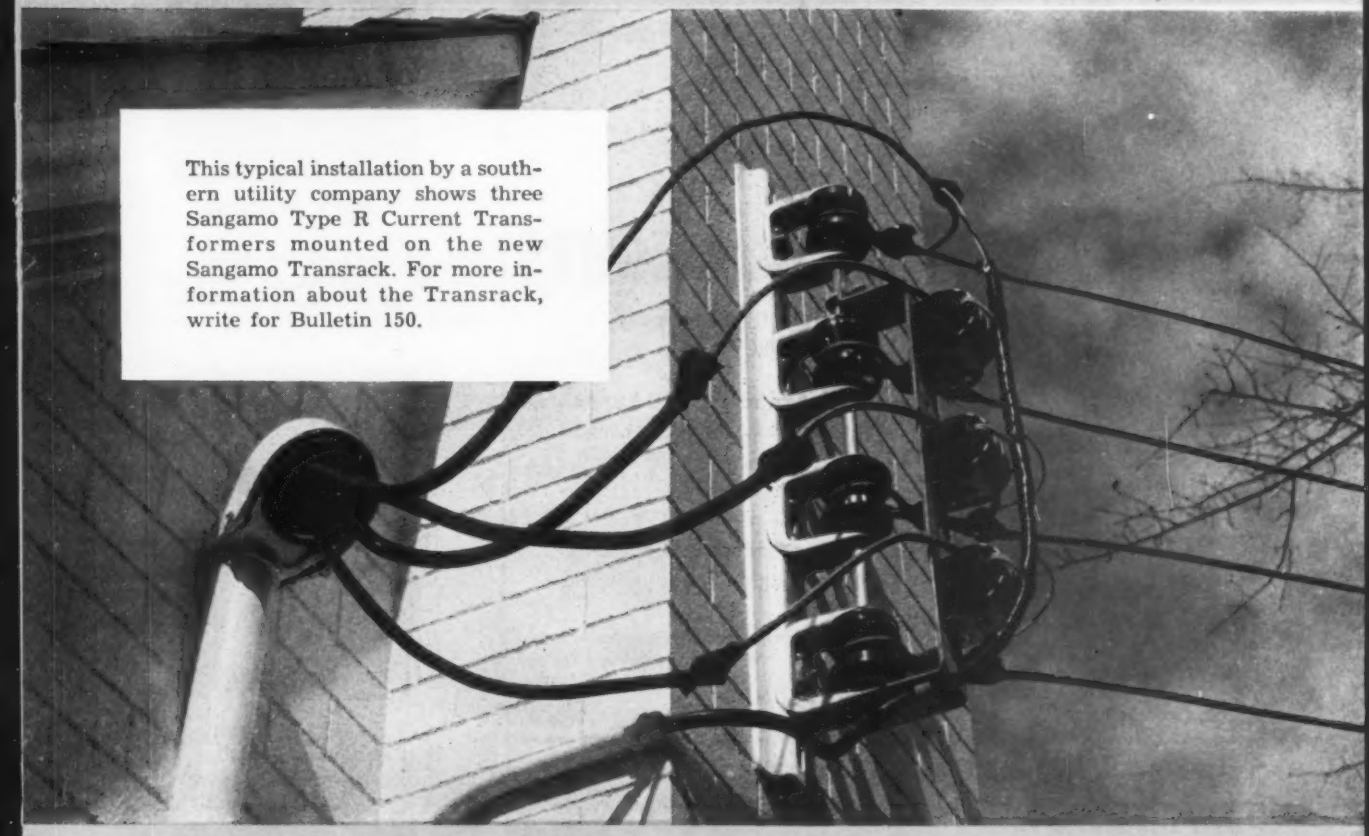
The Type R is light enough to be supported by the primary conductor only.

Type R's are encased in a high impact, phenolic shell, filled with a thermo-setting plastic that eliminates voids and prevents moisture from reaching core or windings.

Full information is given in Bulletin 501... be sure to write for your copy today.

EIGHT VARIATIONS OF ONE BASIC TRANSFORMER





This typical installation by a southern utility company shows three Sangamo Type R Current Transformers mounted on the new Sangamo Transrack. For more information about the Transrack, write for Bulletin 150.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

SM55-3

STEBER

"SERIES 4000" FLOODLIGHTS

First choice among lighting men for sports, commercial and industrial lighting

"Series 4000" Floodlights are designed to meet NEMA specifications and are available in a variety of beam patterns and with mounting provisions for every application. Write for complete details—See how Steber features provide better lighting at lower cost.

Other Steber Series of floodlights—open and enclosed types from 100 to 1500 watts, are available in deluxe and economy models.

New Floodlighting Literature available now. Write for your copy today.

Lighting Units **STEBER** *for Every Need*

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SOLD THROUGH LEADING DISTRIBUTORS

Atlanta. In August, 1937, he was elected vice-president and manager of the Rome division. In 1950 he was transferred to Atlanta as vice-president and division manager and on April 5, 1951, was elected executive vice-president.

Mr. Oliver, a native of Dadeville, Ala., is a veteran of 41 years of service with the Georgia Power Company and associated companies. Following his graduation from Alabama Polytechnic Institute in 1915 he joined the Alabama Power Company, working in the construction and operating departments. From 1916 to 1927 he served as operating engineer. In 1927 he joined the Georgia Power Company as operating manager. In 1944 he was elected vice-president in charge of operations and in 1951 vice-president and general manager.

D. J. Biller, chairman of the board of **Day-Brite Lighting, Inc.**, St. Louis, Mo., announces the appointment of **James F. Whitehead, Jr.** as executive

James F. Whitehead

vice-president of the company, and **George J. Taylor** as vice-president in charge of Eastern Operations. Mr. Whitehead was formerly vice-president in charge of Sales, and Mr. Taylor was Eastern District sales manager.

George J. Taylor

Mr. Whitehead, who joined the Day-Brite organization in 1944, as

Compare Allis-Chalmers Regulators with Others

How to Save 75% on Service

Unit Construction of Allis-Chalmers Regulators permits on-the-spot service

All that's needed is a two-man crew in a light pickup truck to set up the hydraulic jack and take care of inspection on the spot.

Inspecting other regulators usually requires moving the regulator and piecemeal untanking... using larger crews and expensive equipment. This costs 4 to 5 times more.

Unit construction means you remove only the bolts from cover and control for untanking. This simplified process can save 75% of service costs.

For complete information on these dollar-saving regulators, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

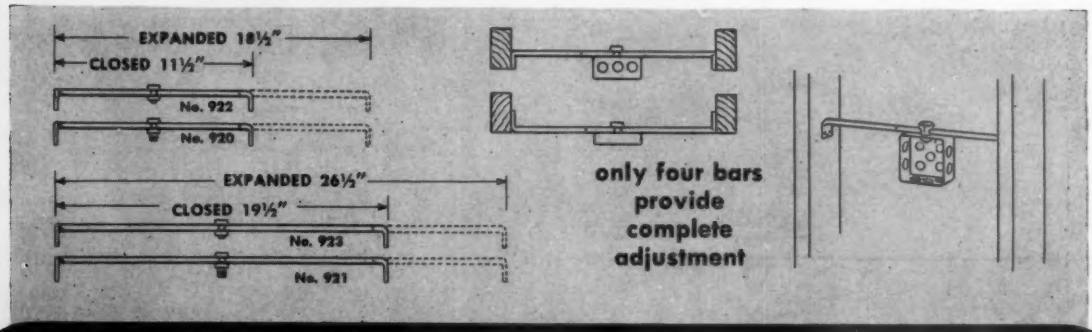
ALLIS-CHALMERS A-C A-5141

NOW! RACO OFFERS

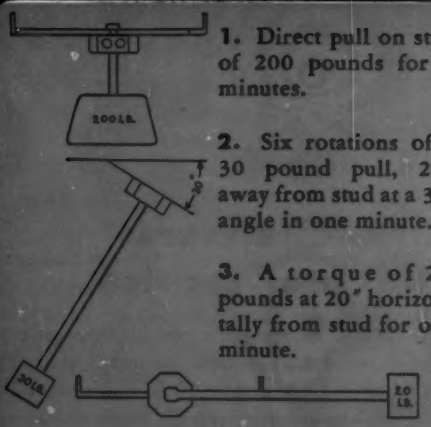
the first adjustable bars that fill every requirement... pass every test!

ONLY 4 BARS ENABLE YOU TO INSTALL ANY DEPTH BOX WHEREVER YOU WANT IT REGARDLESS OF STUDDING SIZE OR SPACING

STOCK JUST 4 BARS INSTEAD OF 16



NORMAL SAFETY PRECAUTIONS REQUIRE THAT A BAR MUST WITHSTAND THESE TESTS

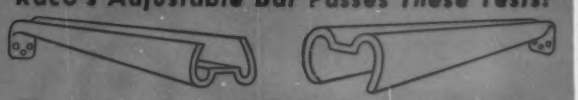


1. Direct pull on stud of 200 pounds for 5 minutes.

2. Six rotations of a 30 pound pull, 20" away from stud at a 30° angle in one minute.

3. A torque of 20 pounds at 20" horizontally from stud for one minute.

Raco's Adjustable Bar Passes These Tests!



There is strength to spare due to these special formations!

Use Raco's New Clip or Popular Stud!

The new Raco Clip uses a strong new saddle of 13 gauge steel, formed steel clip and short, strong No. ¼-20 round head screw.

Popular Raco Stud uses the same saddle, a formed 13 gauge steel stud with six full, deep No. 20 threads and a stout No. ¼-20 screw.

Raco Clip provides ample room for device and added wiring space in any type box.

WRITE TODAY • ***get complete information on Raco Bar Hangers***

YOU CAN ALWAYS DEPEND ON RACO

ALL-STEEL EQUIPMENT INC. Aurora • Illinois

a factory representative covering Georgia, Alabama, and Eastern Tennessee, is a native of Athens, Ga. He was educated at Georgia Tech. Before joining Day-Brite, he was associated with Georgia Power Company as district superintendent and architectural lighting specialist. Loaned to Robert & Company in April, 1942, he designed the lighting for the Bell Bomber Plant, one of the largest installations in the world.

A longtime member of the Illuminating Engineering Society, he was instrumental in organizing the Atlanta Lighting Club, a forerunner of the I.E.S. Chapter there. Later, he served as Regional vice-president of the Southern Region of the Society, and in recent years, has served as a national director. At present he is a member of the Advanced Planning Committee and Public Relations Information Committee.

Mr. Taylor, who came to Day-Brite in 1946, holds degrees of Bachelor of Science and Electrical Engineering from Armour Institute of Technology, a Master of Science Degree from Massachusetts Institute of Technology, and is a member of the honorary electrical fraternity, Eta Kappa Nu.

His background includes five years as chief estimating engineer of manufacturer parts and products at G & W Electric Specialty Co. In 1939, he went to General Electric Company at Nela Park, Cleveland, as head of the Industrial Section of the Engineering Division. In 1942, he was appointed supervisory engineer for the New York area, where he devoted considerable time and study to the lighting of offices, schools, and stores.

Mr. Taylor's long membership in the Illuminating Engineering Society includes work on the Office and Industrial Lighting Committees, and hundreds of articles on these two types of lighting installations, contributed to leading trade magazines. At present, Mr. Taylor is junior vice-president of the Society.

Key management changes were announced recently by **Arkansas Power & Light Company** which effect its operating staffs in Searcy and Forrest City.

W. P. Patten, Forrest City, will become manager of the Northeast Division, succeeding **R. D. Caldwell** who has decided to retire because of his health. Mr. Caldwell has been identified with the development of the electric industry in Arkansas for the last 36 years.

Mr. Patten is a veteran of more than 30 years with AP&L. He started as a laborer building power lines in 1925 and has served in a number of jobs connected with electric operations and construction since that time. He has been superintendent of the Eastern Division since 1944.

Mr. Caldwell is among the pioneers of modern electric service in Arkan-

TRADE ARRO MARK
spiral-drive
NAIL ANCHOR
For All Masonry
(RUST PROOFED)
DRILL HOLE
Same diameter as anchor. Depth should be length of anchor less thickness of fixture.
INSERT ANCHOR
Through fixture and tap it into masonry flush against the fixture.
PLACE NAIL
Into anchor and hammer nail until fully inserted.
The fully inserted nail will expand the anchor and fasten the fixture firmly and neatly to the masonry.
13 SIZES AVAILABLE
Diameter and Length
from 3/16"x3/4"
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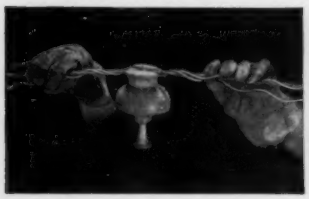
TURN MINUTES INTO YEARS OF *Protection* at the vital points of overhead conductors

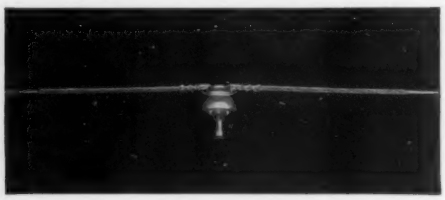
fine FANNER SUPERFORMED ARMOR RODS

are easily applied . . . provide positive full-length grip and absolute uniformity of application

Fine Fanner SUPERFORMED Armor Rods offer the economical way for positive, lasting protection of overhead transmission and distribution lines. Their INSTALLED cost is so small compared with the service failures they prevent, it pays to install them at all points where vibration damage is likely to occur.*



Armor rods are easy to apply.



Completed armor rod installation.

Whenever you need accessory items for overhead conductors you'll do far better by standardizing on fine Fanner SUPERFORMED products. Each product in the Fanner SUPERFORMED line is carefully engineered and accurately manufactured. Highest quality materials provide long service life. Special packaging insures safe delivery and protection in storage. With all their extra features, Fanner SUPERFORMED products cost no more than ordinary products.

Armor rods and other products in the SUPERFORMED line are fully described in current literature. Write today for your copy.

*Where spans are short and tensions low, use Fanner SUPERFORMED lineguards.

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AGENTS AND DISTRIBUTORS IN PRINCIPAL CITIES

TAP ARMOR | PLASTIC FANNGUARDS | PATCH RODS | FANNGRIPS

sas, having started to work in the old Camden Power Plant in 1920. He managed the Camden territory from 1925 to 1944, when he was promoted to division manager at Searcy.

George L. Draffan has been elected to the newly created post of chairman of the board and chief executive officer of **The Ohio Brass Co.**, Mansfield, Ohio. **Roger A. Black** will succeed Mr. Draffan as president and chief administrative officer of the company.

Mr. Draffan has served as Ohio Brass president since 1946 and has

George L. Draffan

been with the company since 1916. He started in the company's advertising department and later became general sales manager in 1928, vice-president in 1933, and executive vice-president in 1938.

A director of the National Association of Manufacturers and a member of National Electrical Manufacturers Association, Mr. Draffan was born in Buffalo, N. Y., and attended school in Buffalo and East Aurora, N. Y. He belongs to the Electrical Manufacturers Club of New York.

Mr. Black has been general factory manager since 1949 and vice-

Roger A. Black

president since 1953. He joined the company in 1930 as a member of the Foreign Trade Department and was named manager of the department

ADVANCED DESIGN

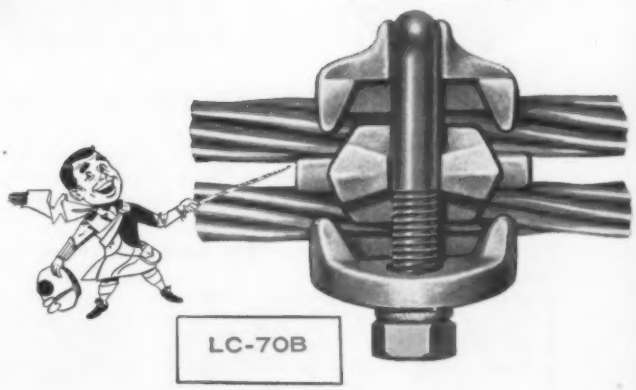
- LONGER CONTACT LENGTH
- ASSURED INHIBITOR PROTECTION
- REDUCED CABLE DISTORTION

ANDERSON ALUMINUM PARALLEL GROOVE CONNECTORS WITH "COVER ALL" SPACER

The illustrations here tell a graphic story of Anderson's progress in aluminum . . . *a 30-year, pioneering span of bed-rock engineering* . . . to give the electrical power industry the products to *most efficiently* meet growing demands.

The new, advanced design of these U-bolt type parallel groove connectors accomplishes *ALL SIX OF THE SOUGHT-FOR MAJOR REQUIREMENTS!* (1) More efficient cable contact. (2) Increased pull-out strength. (3) Protection for inhibitor. (4) Maintains cable configuration by completely enclosing and protecting it. (5) Extended spacer helps to speed installation. (6) Greater range without sacrifice . . . due to advanced design of of spacer . . . reduces stocking.

Ask your ANDERSON Representative to give you the complete facts . . . test data . . . ratings . . . and cable ranges of these new connectors. Or, write to our home office.



Aluminum & Bronze POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES
for SUBSTATION • TRANSMISSION • DISTRIBUTION

ANDERSON ELECTRIC

CORPORATION

BIRMINGHAM 1, ALABAMA

three years later. In 1937 he was appointed to the board-of-directors.

Born in Mansfield, Mr. Black graduated from Mansfield public schools and from Princeton University with a Bachelor of Arts degree. He is a member of American Institute of Electrical Engineers and National Foundry Association.

Albert Korenblat, a prominent electrical contractor and owner of the I. K. Electric Company, of Little

Albert Korenblat

Rock, Ark., died November 19, 1956. Mr. Korenblat, 53, was one of the oldest members of the National Electrical Contractors Association in the southwest. He had been a member for 31 years and was a past president of the Arkansas Chapter, and at the time of his death he was Arkansas' representative on the NECA National Board of Governors.

He is survived by his widow Eva; two sons Arthur and Gilbert; a daughter Mrs. Morris Raff; his brother Maurice, and a sister Dr. Pauline Tenzel. Mr. Korenblat's brother Maurice, who has been manager of the business for the past three years, will continue in that capacity, assisted by Mr. Korenblat's oldest son Arthur.

Howard Electric Company, of Chicago, announces that **Irwin F. Runge** has joined their factory sales organization. Howard manufactures the Howarduct underfloor wire distribution system. Mr. Runge formerly represented the Killark Co. nationally; and will serve the Howard Co. in the same capacity.

J. D. Auckland has been named assistant manager of the Lighting Standard Division of **Kerrigan Iron Works, Inc.,** Nashville, Tenn., New York and Chicago.

Mr. Auckland started as a chemist with Wilson Sporting Goods Co., Chicago. Later he became testing engineer for Wisconsin Steel, was sales engineer at Central Solvents and Chemicals Co., Chicago., and for six years was sales manager in the In-

J. D. Auckland

dustrial Lighting Equipment Division of Quadrangle Manufacturing Co., Chicago.

The appointment is in line with Kerrigan's expansion in the growing lighting standard field.

James Dandelake, president of Miller Electric Co., Jacksonville, has been re-elected president of the Jacksonville-Duval County Safety Council. The election was held at the recent annual membership meeting.

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

REVOLUTIONARY NEW...
Super
Twist-Lock®
CUTS WIRING TIME 1/3rd

Tests prove it... one out of every three wiring minutes SAVED with Super Twist-Lock, thanks to Hubbell's exclusive screwless PRESSURE GRIP terminals and DEAD FRONT construction. FASTER, SAFER, BETTER in every way!

CAT. NO. 3321
3-WIRE
CAT. NO. 3323

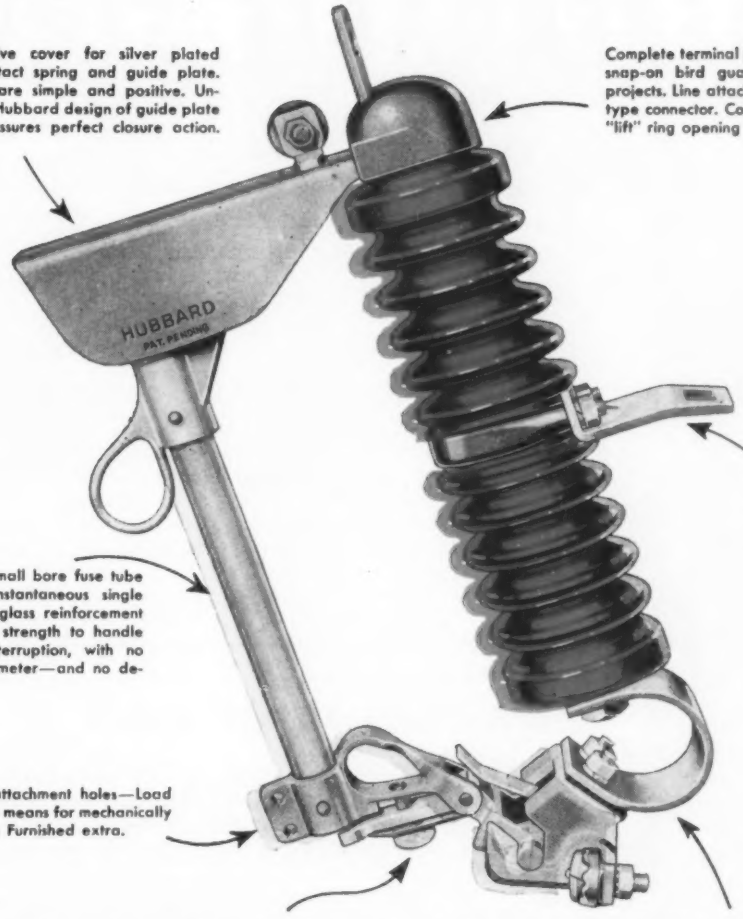
6 EASY WIRING STEPS

1. Use knurled section on shell as strip gage. Insulation left on wire ends can simplify insertion by containing strands.
2. Spread cord clamps and insert conductors into holes making sure green (ground) conductor enters hole marked GR.
3. With cord pressed in firmly, tighten cord clamps to maintain position.
4. Judge approximate wire length and snip off excess.
5. Bend each conductor outward into its individual pocket and press firmly into place.
6. Insert dead front into keyed shell and engage the two sections securely by tightening each screw alternately until all are firmly seated.

ACT NOW

HARVEY HUBBELL, INC.
DEPT. R-2 BRIDGEPORT 2, CONNECTICUT

Write today for complete story


Sleet Hood, protective cover for silver plated phosphor bronze contact spring and guide plate. Closure and contact are simple and positive. Unaffected by weather. Hubbard design of guide plate and contact spring assures perfect closure action.
Complete terminal protection is provided by flexible snap-on bird guard through which a "lift" ring projects. Line attachment is by means of transformer type connector. Conductor may be snubbed through "lift" ring opening if desired.
HUBBARD
PAT. PENDING
New style, extra strong, insulated hanger. Coating provides bird and animal protection.
Specially designed small bore fuse tube for high pressure instantaneous single vent expulsion. Fibreglass reinforcement provides mechanical strength to handle maximum current interruption, with no increase in bore diameter—and no destructive results.
Load break fitting attachment holes—Load break fittings provide means for mechanically disrupting connection. Furnished extra.
Cam locking device which permits unobstructed removal of fuse holder when in the open position, in addition to locking holder against accidental removal the instant closure is begun. Spring actuated leverage arrangement puts tension on fuse link to aid in quick opening.
Locked recoil absorber bracket is provided to cushion recoil of discharge action. This prevents damage to the porcelain and mechanical assembly under stress of maximum current interruptions.

New Hubbard Distribution Fuse Cutout!

Now from Hubbard a new heavy-duty fuse cutout that opens a new era in the protection of equipment on your distribution lines. Incorporating new electrical and mechanical designs, the new Hubbard Cutout offers tremendous operational flexibility with its ability to clear faults over the entire operating range from minimum to maximum available fault current. No longer will it be necessary to continually check available fault current values at many different points as your system is expanded. What's more, the need for shifting cutouts to handle changing fault current values will be drastically reduced.

Heart of the new design is the small bore fibreglass reinforced, single vented fuse tube. By using a minimum inner diameter fuse tube and reinforcing it with fibreglass for maximum mechanical strength, Hubbard engineers were able to provide the positive expulsion action necessary for safe, sure, instantaneous arc interruption.

To support this greatly increased bursting action, entirely new high strength mechanical components were provided. There are no unnecessary or complicated parts in this new rugged simple design. Gas expulsion and fuse blowing are substantially completed before any parting of current carrying contacts. The entire current carrying circuit is composed of silver plated contacts of the pressure type. All springs are designed to act well below their elastic limits for maximum pressure maintenance throughout the life of the cutout. Positive closing is assured through the cam arrangement of the hinge mechanism which causes the fuse tube hinge to tighten as the fuse approaches the latched position.

Equipped with sleet, bird proofing and dead-end eye to meet local service conditions. Mechanical load break attachment can be specified as needed. Your Hubbard distributor will be glad to supply you with production samples. Call today, or write for a copy of Bulletin 756.

HUBBARD AND COMPANY

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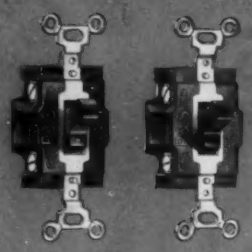
FOR DEPENDABLE SERVICE

ON HEAVY DUTY JOBS

P&S

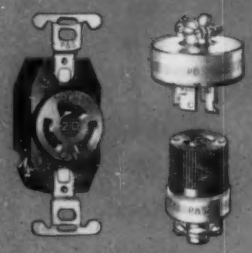
THE BEST COMES FROM P&S

Over 65 years of leadership in the wiring device field have taught the industry to look to Pass & Seymour for the Precision Manufacturing and Creative Engineering that means stronger, longer-lasting, simpler-to-use wiring devices.



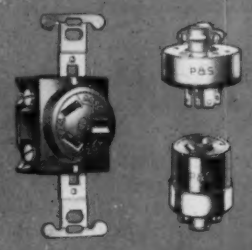
P&S SUPER AC SWITCHES

Pass & Seymour-engineered for extra long life on HEAVY DUTY service. P&S Super Switches can be used at *full* rated capacity on fluorescent, incandescent, and inductive loads, and can control motor loads up to 80% of switch rating. Rated 15 and 20 amperes, 120 Volts A.C. to 277 Volts A.C.



P&S TURNLOK® LINE

Heavily armored caps . . . sturdy, two piece bodies for longer life. Easy back or side wiring. Available in 10 and 20 amperes – 2, 3, and 4-wire types. Modern face design plainly indicates ampere ratings on all receptacles.



P&S POLARIZED DEVICES

Extra heavy bodies and extra heavy metal parts withstand hardest wear for longer periods of time. All receptacles have extra design features to make installation easy and quick. Available in 10 and 20 amperes – 2, 3, and 4-wire connectors, receptacles and caps.

For wiring device quality, always look for these outstanding devices.
The original Despard Line®
P&S Surfex®
Roto-Glo® Switches
Uniline® Wall Plates
Alabax® Fixtures
Complete line of Switches, Outlets and Lampholders

Every year, more Pass & Seymour wiring devices are sold. The strength, durability and, most important, the speed and simplicity of installation of all P&S products make them the specified choice of electrical contractors everywhere.

Write Dept. ES-16 for full listings and descriptions of these and all other types of wiring devices in the *complete* quality Pass & Seymour line. For accuracy's sake—order only by P&S catalog number.

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SYRACUSE 9, NEW YORK
60 E. 42nd St., New York 17, N. Y. 1229 W. Washington Blvd., Chicago 7, Ill.
In Canada; Renfrew Elec. & Refrig. Co., Ltd., Renfrew, Ontario

A. B. Chance Co., of Centralia, Mo., announces the establishment of a new sales region and the appointment of **Frank C. Voelker** as regional sales

Frank C. Voelker

manager. This new region includes Michigan, Indiana, Kentucky, Ohio, the western half of Pennsylvania, and parts of Virginia and West Virginia.

A Chance sales representative the past year, Mr. Voelker came to the Chance Company from the Seyler Manufacturing Co., where he was sales manager for ten years. The new regional sales office will be located in the A. B. Chance Company's Pittsburgh plant.

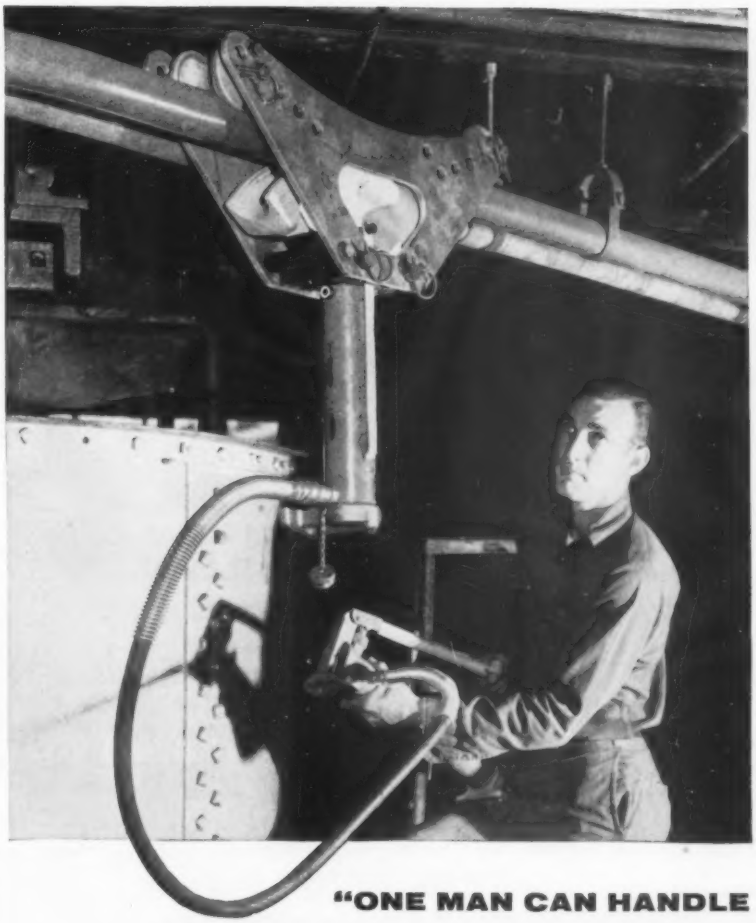
Wilbur H. Peter, Jr., has been elected a vice-president of **Square D Company** and becomes division manager of the Electric Controller Division in Cleveland, Gordon Patterson, president, has announced.

Previously works manager of the division, Mr. Peter succeeds **Alvin C. Dyer,** who is retiring as vice-president and division manager but will continue active with Square D as a consultant on the application of the company's electrical controls to steel mill and related heavy industry operations, a field in which he has been active for almost a half-century.

Mr. Peter joined Electric Controller and Manufacturing Company as a sales trainee in 1937 and has been works manager since the firm was merged into Square D last year as a division. He served as a field engineer in Electric Controller's Pittsburgh office for seven years and subsequently held various production and personnel responsibilities in the Cleveland plant.

Robert K. Miller has been appointed general manager of the **General Electric** Home Heating and Cooling Department in Tyler, Texas, according to R. H. Jones, general manager of the General Electric Air Conditioning Division.

Mr. Miller assumes his duties at the Department's new headquarters in Tyler where the company has re-



"ONE MAN CAN HANDLE ALMOST ANY CONDUIT PROBLEM with a portable Greenlee Hydraulic Conduit Bender,"

says R. A. Branford, Chief Electrician, C. F. Church, Monson, Mass.

Pictured above is another unusual conduit bending job being performed by the No. 880 GREENLEE Lightweight Hydraulic Bender. It's being used to form offsets in an existing conduit and "raise it," so that new machinery can be moved under it without interfering with electrical service.

In reporting on this work at C. F. Church Division of American-Standard, Monson, Mass., Chief Electrician R. A. Branford says that the GREENLEE Bender saved eight hours of work and about $25 in fittings, plus large savings in the form of non-interruption of plant operations. You'll find many timesaving and moneysaving advantages in having a GREENLEE Bender on your jobs, too. Portable, one-man carried, one-man operated. *Makes full 90° bend with one ram stroke.* Quickly makes the exact bends you need in all sizes of conduit and pipe from ½" to 2". Entire unit is easily used on the floor, on a bench, or aloft as shown above. Easily operated with hand pump or can be teamed with a GREENLEE power pump for fast production jobs. Write for complete details.

MACHINERY & TOOLS
GREENLEE

GREENLEE TOOL CO., 1781 COLUMBIA AVENUE, ROCKFORD, ILL.

cently completed a 15 million dollar plant for the manufacture of home cooling units. Limited operations are in progress at this plant.

Prior to his appointment, Mr. Miller was manager of manufacturing for the Vacuum Cleaner Department, Cleveland, Ohio. He joined General Electric in 1947.

Charles L. Snail has been appointed by **Line Material Company** to the position of field engineer. He will establish his headquarters in Topeka, Kansas, to represent L-M in northeastern Kansas and northwestern Missouri.

A native of Kansas, Mr. Snail is an electrical engineering graduate of Kansas State College, and is a member of AIEE. Prior to joining L-M, Mr. Snail had seven years experience in electric distribution and utilization. He is registered in Kansas as a professional engineer.

W. A. Curtis, manager of the Fan and Blower Division, Peerless Electric Company, Warren, Ohio, and recently named national chairman of the **Air Moving and Conditioning Association's (AMCA) Engineering Committee,** has just revealed that his committee has undertaken several projects of importance to industry nationally.

"We are now working on four major projects," states Mr. Curtis, "which we believe will be of great importance, both to industry and to the ultimate user. Not necessarily in order of importance, they are: First, a revision of the existing code for testing air moving equipment which will contribute to a uniform, accurate determination of performance ratings.

"Our second project is to develop accurate Pitot tubes of smaller sizes. We have many new problems in the movement of air today, which call for smaller Pitot tubes of high accuracy. Not only is the number of small fans increasing but there are many devices where air pressures are quite low while some high pressure units have highly restricted outlets.

"Our third assignment is to set up standards for power roof ventilator base sizes. This will offer the consumer the advantages of simplified installation and replacement which has long been provided by standardization of sizes in other air moving equipment.

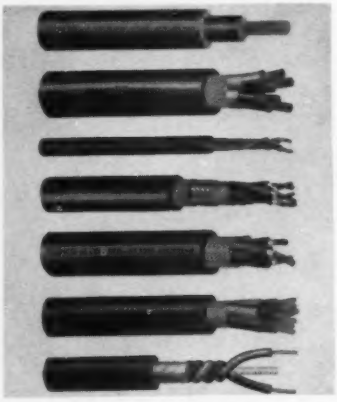
"Our other project is to make recommendations for preparation of fans which require protective coatings. Our problem is to determine the best method of preparing the fan to receive the diverse protective coatings required for different types of installations. On this project, we are working in collaboration with the National Association of Corrosion Engineers."

New products

Variety of cords, cables announced by Bronco

WESTERN Insulated Wire Co., 2425 E. 30th St., Los Angeles 58, Calif., manufacturer of electrical wires and cables, has announced the production of several new items.

Two kinds of Type U.S.E., Style RR nonmetallic-sheathed 600 volt cable are being offered under the Bronco label. One kind is suitable for direct burial in the earth. The



other is a general purpose designed for raceways, ducts, or open wiring. Both are made with a Neoprene outer sheath which is branded with full identifying data every two feet, and heat-resistant, super-aging rubber insulation.

Bronco 66 Certified Type SO shielded cords are now made with two, three, or four conductors, sizes 18 through 10. The Bronco 66 shielded control cables are made with five, six, seven, eight, ten, or twelve color-coded conductors in sizes 18 through 14.

Some of the most severe operating conditions portable cords and cables face are met when used on retractbale take-up reels, such as on foundry sand cutters, lifting magnets, cranes, and mine drills. To greatly extend the life of power lines used under these circumstances, Western Wire has designed and is manufacturing special cords and cables which have acquired the unofficial designation Type "P & R." The Bronco 66 Certified Type SO "P & R" cord is made in sizes 18 through 10 with two, three, or four conductors. The Type W "P & R" cable is made in two and three conductor round, sizes 8, 6, and 4, and as a two conductor flat twin parallel cable, sizes 8 through 1. A special reenforcing braid of high tensile cotton yarn over the assembled conductors and under the jacket greatly extends the flex-life of these cords and cables.

Six hundred volt control cables for stationary installation in important control circuits have been added to the Bronco 66 Certified line of portable control cables. The stationary control cables are available from stock in AWG sizes 14, 12, and 10 with from two to twenty-four conductors. Conductors are coated, stranded copper.

For additional data, ask for item P-115, using the coupon on page 12.

New hinged-cover wireway open for lay-in wiring

A NEW hinged-cover wireway, completely open for lay-in wiring, has been announced by General Electric's Distribution Assemblies Dept., Plainville, Conn. The new wireway is particularly useful where space is limited and building contours are complicated.

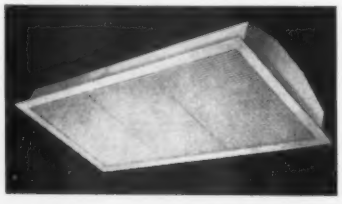
Labeled the Type HW, the new wireway has a hinged cover which opens over the entire length of the run to allow "lay-in" wiring through every length and fitting. Eliminated is the customary method of threading the conductor through collars.

General Electric's Type HW wireway comes in 1-, 2-, 3-, 4-, and 5-foot lengths and is made in three different sizes — 4" x 4", 6" x 6", and 8" x 8". A complete line of standardized fittings is also available, allowing the wireway to be tailored to the contours of virtually any building.

For additional data, ask for item P-116, using the coupon on page 12.

Eight new models of recessed troffers

EDWIN F. GUTH Co., 2615 Washington Blvd., St. Louis, Mo., announces eight new models of 2' wide Guth



recessed troffers that install into 83 different ceiling suspension systems.

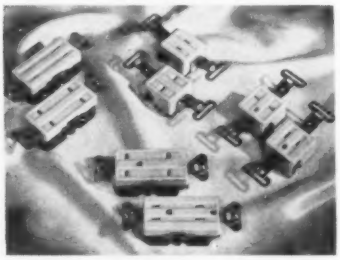
The new troffers feature the Gratelite louver diffuser — unique 3/8" cubicle facets, 45° x 45° shielding, for the highest illumination intensities with the lowest apparent bright-

ness. Models are also available with Skytex and low brightness lenses.

For additional data, ask for item P-117, using the coupon on page 12.

New wiring device line in contemporary design

AN OUTSTANDING new wiring device is the Sierraplex, specification grade line of receptacles by Sierra Electric Corp., 15100 South Figueroa St., Gardena, Calif. A complete line of outlets, both two-wire and grounding



type, single and duplex, in either tandem or parallel slots, are available in a new, contemporary design to answer the needs of architects and builders in the growing quality market.

Every receptacle need of the builder can now be satisfied through one source with all units perfectly matching throughout. Complementing these outlets are matching Sierra wall plates, in a wide variety of combinations and sizes in either plastic, stainless steel or brass.

Several unique construction features have been incorporated into the new units to assist the contractor in making faster and easier installations. Among these are specification grade throughout, holes provided for back wiring, handy wire strip gage, large binding screws for conventional side wiring, break-off strip for two-circuit installation, two hexagonal units fully encased in arc-resistant green screws for grounding wire, and plastic housing.

For additional data, ask for item P-118, using the coupon on page 12.

Outdoor lighting kit for color spotlighting

A NEW OUTDOOR color lighting kit for use with the common 75 watt and 150 watt sealed beam projector lamps put out by all major lamp manufacturers, has just been announced by Stonco Electric Products Co., Kenilworth, N. J. It consists of an aluminum lensholder that slips easily over the lamp to lock in place with stainless steel clips, and four interchangeable color lenses in red, green, amber and blue.

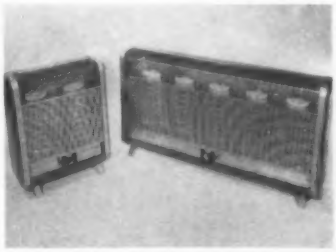
The color lenses are made of tempered, natural-color glass that is reported to transmit deep, rich color-beams with a minimum of light loss for color spotlighting and floodlighting indoors or outdoors in any weather.

For additional data, ask for item P-119, using the coupon on page 12.

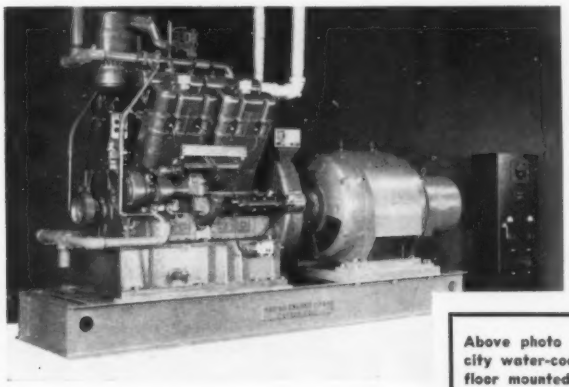
New portable heater line introduced by Ceilheat

CEILHEAT, INC., Knoxville, Tenn., manufacturer of radiant heating cable and wall insert heaters, has just announced the introduction of a complete line of portable heaters.

The new Ceilheat portable heaters feature Ceilheat's "Delta Cone" de-



sign which increases radiation through the angular shape of the cone itself and the cone position in relation to the reflector. As in the



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for HOSPITALS — INDUSTRY — CONSTRUCTION PROJECTS — MILITARY INSTALLATIONS — SCHOOLS — COLLEGES — THEATRES — RESTAURANTS — HOTELS — MOTELS — AIRPORTS — ETC.

Wherever power is a vital part of the operation of a building or a process, a YOUNG Emergency Automatic Electric Generating Unit is a necessary safeguard against the loss of life, time, or money thru the failure of regular power source.

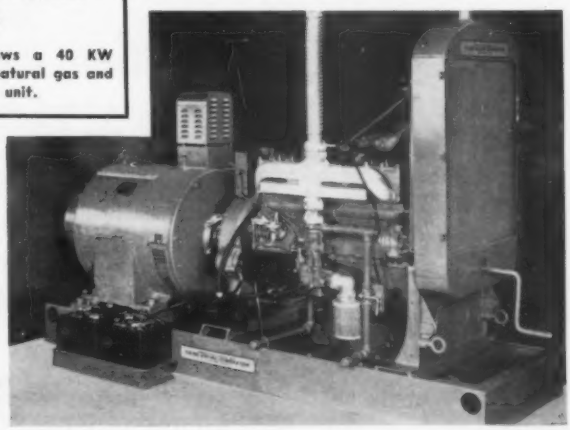
Each YOUNG unit is compact and complete, mounted on welded steel base, and conforms to NEMA and AIEE standards.

Above photo shows a 150 KW, city water-cooled, gasoline unit, floor mounted control panel.

●

Photo below shows a 40 KW Packaged Type, natural gas and gasoline-powered unit.

YOUNG AC generating units are powered by gasoline, natural gas, Butane gas, or diesel-powered in capacities of 25 KW to 300 KW. Manual, remote, automatic or semi-automatic starting controls optional. Write for Bulletin No. 42-ES.



YOUNG ENG. CORPORATION, Canton, Ohio

YOUNG

Generating Units

Better installations in less time

Simple, quick to install

BLACKHAWK 540 BOX SUPPORT

stays rigidly in place

The Blackhawk No. 540 one piece box support slips into the wall opening and tabs are bent back to hold it in place. After the switch box is installed, the tabs are bent to the inside of the box squeezing it firmly in place. It's that simple and quick.

It makes a permanent installation because the Blackhawk 540 box support is a large single piece . . providing rigid, unified support. It does not wiggle or saw because it is parallel to the wall.

For simple, quick, permanent switch box installation, specify Blackhawk No. 540 box support. Ask your electrical distributor for Blackhawk.

Blackhawk Industries

BLACKHAWK INDUSTRIES
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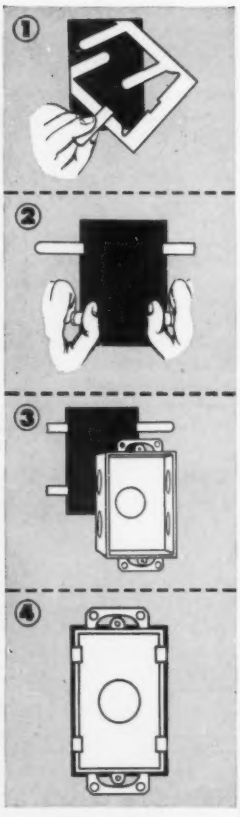


NOW! EFFICIENT PACKAGE ROOF FANS FOR EASY INSTALLATION!

"BUFFALO" SKY-VENT(r) POWER ROOF VENTILATORS

Yes, complete units with motor, fan, housing, weather hood, dampers and integrally welded roof curbing—ready to install! "Buffalo" Sky-Vents(r) are ideal for your roof exhaust jobs in the wide capacity range from 1000 to 250,000 cfm. Available in Style "H" (illustrated) or cylindrical vertical discharge Style "V", both of typical heavy-duty "Buffalo" construction with efficient "Buffalo" Propeller or Axial Flow Fan. Write for Bulletin FM-2345 and prices on these popular new fans.

"Buffalo"

BUFFALO FORGE COMPANY
210 Mortimer St. Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities
INDUSTRIAL EXHAUSTERS BELTED VENT SETS PROPELLER FANS
"E" BLOWERS-EXHAUSTERS

Ceilheat wall insert heaters, the close-tolerance thermostat is located directly in the incoming cold air path, enabling it to measure room temperature exactly.

For additional data, ask for item P-120, using the coupon on page 12.

Two new semi-reflector fluorescent mercury lamps

TWO NEW 1000-watt semi-reflector fluorescent mercury lamps which provide improved color rendition and greater light efficiency have been developed by engineers of the Westinghous Lamp Division, Bloomfield, N. J.

According to John H. Max, sales

manager of the Westinghouse large lamp department, the high output, high efficiency lamps make golden-white mercury light practical in high bay industrial lighting applications where fixtures are too small to make efficient use of the fully coated lamp. The new lamps, the D-H12-WD (220 volts) and the D-H15-WD (465 volts) are coated only on the half of the lamp nearest the base. This half color-correcting coating serves a double purpose. It acts as a downward reflector and in addition serves as a color-correcting fluorescent coating. They are recommended for use where uncoated A-H12 and A-H15 lamps are now installed.

For additional data, ask for item P-121, using the coupon on page 12.

New fish tape winder claimed safer, faster

EASIER, faster, safer wire pulling and less tape breakage are advantages claimed by the manufacturer of a new fish tape winder, Holub Industries, Inc., Sycamore, Ill.

The "Tape-Mate" as this winder is called, fits completely around the reel like a sleeve. It is assembled with four screws. Once in place, it stays on the reel permanently. There are no wheels, gears or moving parts to repair or replace as it will last as long as the reel, according to the manufacturer.

Anyone can use the Tape-Mate for it simply slides around the reel. When

holding the reel in the usual manner, the Tape-Mate is pushed forward to wind . . or pulled back to pay out tape. The hands never have to touch the tape.

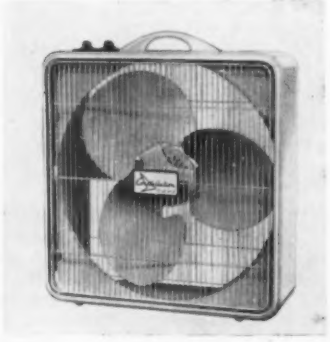
It is claimed that tape can be payed out to the exact footage needed with springing eliminated by a keeper slot. When winding, every foot of tape can be put back in perfect shape as fast as it is pulled from conduit. Uniform tension is produced by a cam pressing against the tape. Finger grip design prevents the hand from slipping and gives a good grip for pulling. The Tape-Mate fits all 12 inch fish tape reels containing ⅛ inch flat fish tape.

For additional data, ask for item P-122, using the coupon on page 12.

New fan accessories permit four-way use

THREE simple and inexpensive accessories allow owners of the new Constellation portables made by Chelsea Fan & Blower Co., Inc., Plainfield, N. J., to make use of their fans in four different ways. Without accessories, it operates as a regular portable fan that can be instantly moved to any location in the house.

The tilt stand accessory, which can be fitted to the fan in a few seconds,



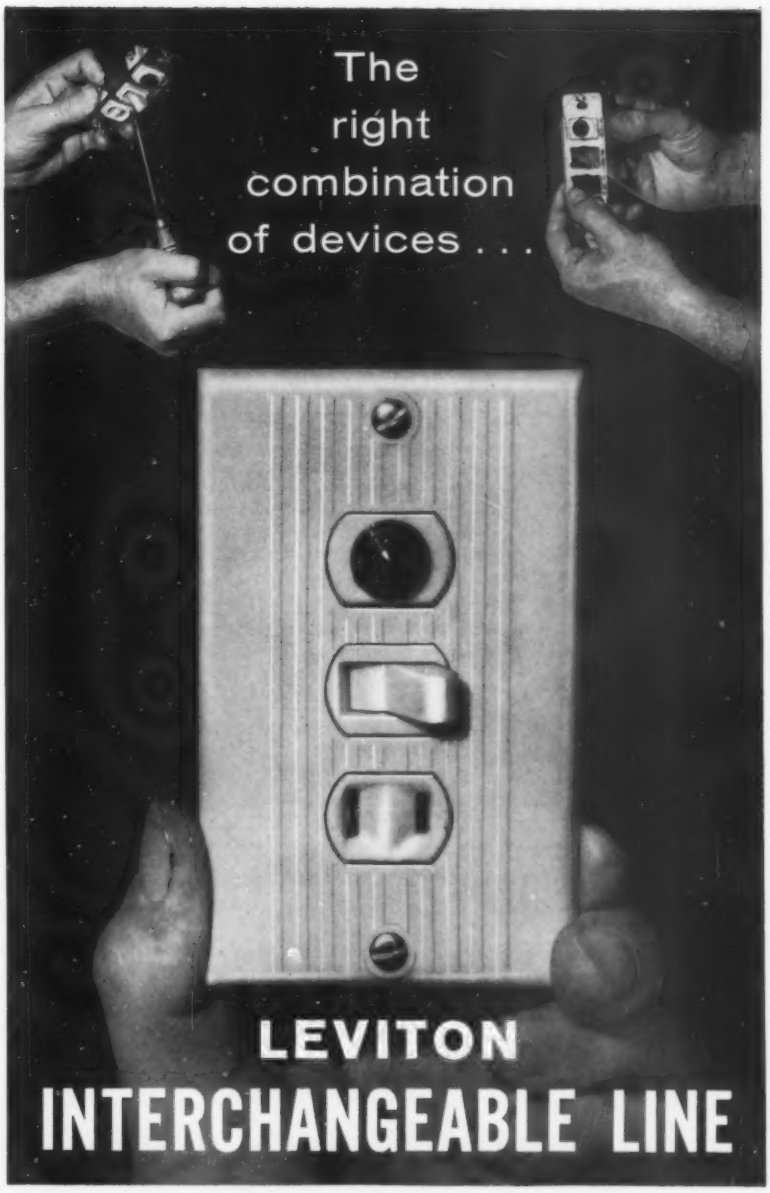
allows the air stream to be directed in any position thru a 90 degree arc from the floor. At 90 degrees, or horizontal, the fan may be used as a hassock unit. A Rollabout stand is also available to bring the fan to window level, swing through a 90 degree arc and be conveniently moved on its own wheels to any room in the house.

Window mounting panels are also available to allow the Constellation to be quickly mounted in any standard window.

For additional data, ask for item P-123, using the coupon on page 12.

Service entrance switch contains five pullouts

FOUR CIRCUITS for such appliances as laundry driers, air conditioners, divided ranges, and water heaters, are available in one cabinet in a new five-pullout service entrance



Now, a newly designed series of devices that can be made up in combination and installed right on the job with a minimum of inventory and a maximum of efficiency. Any combination of one, two or three devices on a single gang can be assembled quickly and easily. Each device locks into the strap with a twist of the screw driver.

With the Leviton Interchangeable Line, you get the devices you want in the combination that is right for the job. And these devices are also interchangeable with other devices of the same type for replacement purposes.

Select from a wide variety of Interchangeable components including Single pole, Double pole, 3-way and 4-way switches; Convenience outlets; Push button; Pilot light; Duplex and Triple outlets.

Devices fit standard boxes and wall plates. Available in brown or ivory phenolic. Newly designed wall plates in metal or phenolic are simply styled, easily cleaned. Listed by Underwriters' Laboratories.

Your best jobs are done with ... LEVITON

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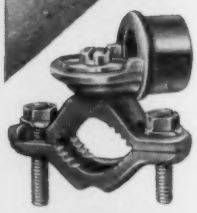
Sherman
RIGID-TYPE
Ground Fittings

are built to give extra long-life service

A special bronze alloy of the highest conductivity and strength is used in Sherman's extra heavy Rigid-Type Ground Fittings. Rugged bodies provide maximum strength and additional stock for extra threads. This extra thread length, plus long, heavy-duty bolts and lock washers provide more clamping pressure.

GF13B for ground wires up to No. 4 stranded AWG. Fits ¼" to 1" pipe and ½" to 1" ground rods.

GF23 for ½" conduit. Swivel conduit hub is adjustable to any position. Capacities same as GF13B.



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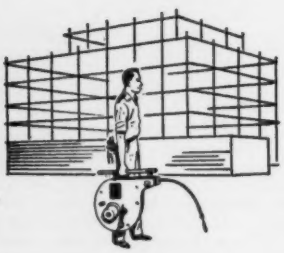
Electrical Fittings for Wire and Cable

BARTH ELECTRIC POWERED CABLE PULLER

The Best Possible Investment for any Electrical Construction Job!



Electrical Contractors and Maintenance Men Everywhere say — any Electrical Construction job Goes Faster — Easier — Cheaper with a Barth Cable Puller.

PUSHES TAPE and pulls wire — up to 3/300 M C M thru 175' of 2½" conduit in one quick setup.

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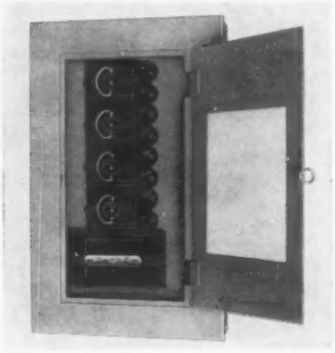
THE BARTH CORPORATION 12653 Brookpark Road, Cleveland 30, Ohio
Please send complete Cable Puller data folder and prices.

NAME _____ YOUR COMPANY _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____

switch developed by the American Electric Switch Division, Clark Controller Co., 1146 E. 152 St., Cleveland 10, Ohio. Besides the four 240-v branch pullouts, the cabinet contains a 100-amp main pullout and eight plug fuse circuits.

Designed to meet the growing need for more 240-v circuits, the new



switch saves labor and material costs by enabling the needs of most modern homes to be satisfied with the installation of a single cabinet.

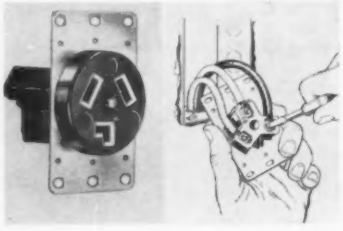
The new switch accommodates any four circuits with its 100-amp capacity, and its four pullouts, available in many combinations of 30 and 60-amp ratings, in addition to eight plug fuse circuits for lights and 120-v appliances.

For additional data, ask for item P-124, using the coupon on page 12.

New power outlet easily installed

THE ARROW-HART & Hegeman Electric Co., Hartford, Conn., announces a new 3-wire polarized flush power outlet. Featuring simplified straight-thru wiring and pressure-type terminals, thus eliminating the need for tilting or for looping and bending heavy wire, it is made-to-order for easy, fast installation.

This new power outlet — 30 amperes, 250 volts — fits any standard



wall case. Mounting flexibility is achieved by a 3-hole mounting plate which permits use in either one or two-gang boxes, or in a 4" or 4-11/16" square box with a plaster cover. An important safety feature is an L-shaped ground slot which prevents the outlet from being interchange-

WHY SMART DISTRIBUTORS STOCK GLOBE

SAFE, SECURE DELIVERY..."Problems of breakage in transit are few and far between with Globe. Their "protective-pack" cartons hold the most fragile of their fixtures safely and securely right to our door."

Robert Mattea, Englewood Electric Supply Co., Chicago, Ill.

FASTER DELIVERY..."I'm always delighted and surprised to see how much faster Globe delivers directly from their stock instead of producing against orders as others do."

C. O. Marionneaux, Interstate Electric Co., New Orleans, La.

A "HOT" LINE..."The 'hot' ones are most often in the Globe line. Their designs are better than beautiful. They are styled to America's lighting tastes."

Jack Minor, Edison Electric Supply Co., Miami, Fla.

EXPERT CRAFTSMANSHIP AND FINISH..."The finer finishes and expert craftsmanship that characterize a Globe fixture go a long way in selling our customers and keeping them sold."

Benjamin Levitt, Avon Electrical Supply, Inc., Jamaica, N. Y.

PROFITABLE LINE..."We heartily endorse Globe's policy of distributing through authorized stocking distributors and backing them to the hilt. This makes Globe fixtures one of our most profitable lines."

Homer F. Davis, San Francisco Lighting & Supply Co., San Francisco, Calif.

more and more distributors are signing up with Globe because...

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Devices:
ONE SOURCE.
Saves you time,
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and job-right
design make
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ask for PAINE "900" LEAD EXPANSION SCREW ANCHORS

Standard machine screws start and turn easily in precision threads.
Special composition lead sleeve expands fast in masonry — cuts down "cold flowing".
Entirely rust-proof — won't deteriorate in damp locations.
Correct taper on threaded steel insert creates maximum expansion. Fast, sure action every time.
Size and directional arrow on every anchor.
12 sizes — for holes 5/16" to 1¾" in diameter — hold from 50 up to 10,000 lbs.
¼-20
PAINE
Setting tool, in every box of 50.

EASY TO USE
DO THE JOB RIGHT
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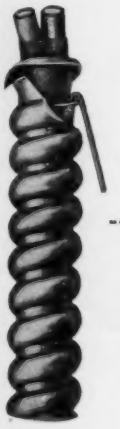

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PEABODY BROTHERS
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able with 50 ampere units. The outlets pressure-type terminals, recessed to provide still another safety factor, will accommodate Nos. 6, 8 and 10 wire.

Single gang and 2-gang wall plates are available in brass or stainless steel, brown (Type No. 9344) or ivorylite (Type No. 9344-1), with 2-gang plates also available with ground slots and contacts.

This new, improved polarized flush power outlet is rated as standard by Underwriters' Laboratories.

For additional data, ask for item P-125, using the coupon on page 12.

Advanced design enclosures provide simple installation

FEDERAL Pacific Electric Co., of Newark, N. J., has revealed a new line of AB-I molded case StABreakers and enclosures of advanced design. The new Type E, F and J frame breakers, which were presented by C. A. Schmidt, product sales manager, provide plug-in ratings from 15 to 225 amperes in only two NEMA 1A

general purpose enclosures. Two additional enclosures, designed for conventional bolted-in Type K, KL and L frame breakers, complete the Federal Pacific AB-I line.

The new type of AB-I StABreakers, Mr. Schmidt said, have been developed as a result of work for war-time needs which proved the economic advantages and engineering features of Type AB circuit breakers with stabs attached. The result has been the development of the Federal Pacific StABreaker line for commercial and industrial applications.

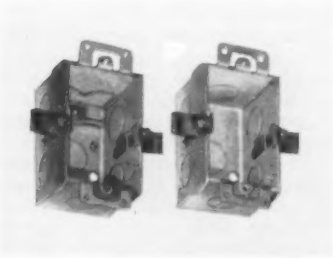
For additional data, ask for item P-126, using the coupon on page 12.

New switch and outlet box designed for rewiring work

SPECIFICALLY DEVELOPED for rewiring work, a newly designed "cut-in" switch and receptacle box has been announced by Chris Buckels, Inc., 2300 S. Springfield Ave., Chicago 23, Ill. The unit features side pressure clamps which hold the box against

plaster or dry-wall construction up to one inch thickness. Clamps inserted from the inside after the box is placed in wall cut-out are drawn up tight against back of wall by long screws.

Top and bottom ears are integral part of the box and hold it against



wall face. Standard dimension box with plated finish is available in two types, one containing two ½-inch conduit knockouts in each side, one in back and one in each end, and the other type having the same ½-inch knockouts in side, back and one end, with the other end having two pry-outs with dual clamp for flexible cable connections. The unit is UL approved.

For additional data, ask for item P-127, using the coupon on page 12.

Hot-dip galvanized threads now on all conduit sizes

HOT-DIP galvanized conduit is now available with hot-dip galvanized threads on sizes ranging from ½" through 6", from Pittsburgh Standard Conduit Co., 61 Bridge St., Pittsburgh 23, Pa.

Pittsburgh Standard now is able to hot-dip galvanize threads on hot-dip conduit in mass production. This major advance has been made possible by an original production technique worked out in the company's new Morrisville, Pa. plant.

For additional data, ask for item P-128, using the coupon on page 12.

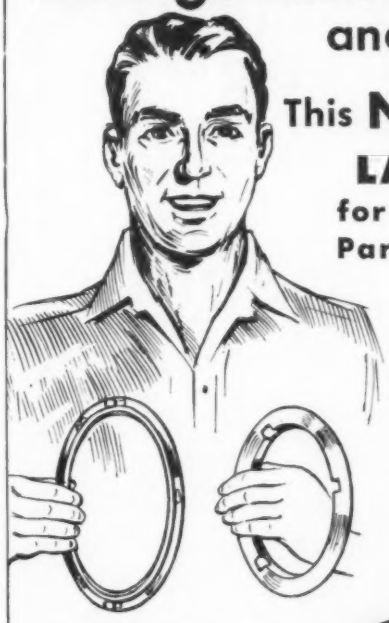
Aluminum fluorescent fixture for outdoor lighting jobs

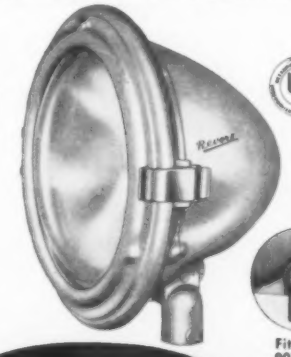
RUGGED and weatherproof, a new aluminum fluorescent fixture for lighting tunnels, underpasses, loading docks or shed areas, has just been introduced by Crouse-Hinds Co., Wolf & Seventh North Sts., Syracuse, N. Y.

Weighing 50 pounds and measuring 72⅛ inches long, the new fixture (type HLG) consists of two assemblies — a housing for the lamps, ballast, wiring, and reflectors, and a door, which supports a gasketed, clear ribbed plastic cover. The door opens by turning three catches; when open, it can be allowed either to hang on its hinges or be removed by unhooking the hinges.

For additional data, ask for item P-129, using the coupon on page 12.

Change these Two Rings and You Convert This NEW Revere ELECTRIC MFG. CO. CHICAGO 40, ILL. LAMP HOLDER for use with either a Par-64 or Par-56 Lamp

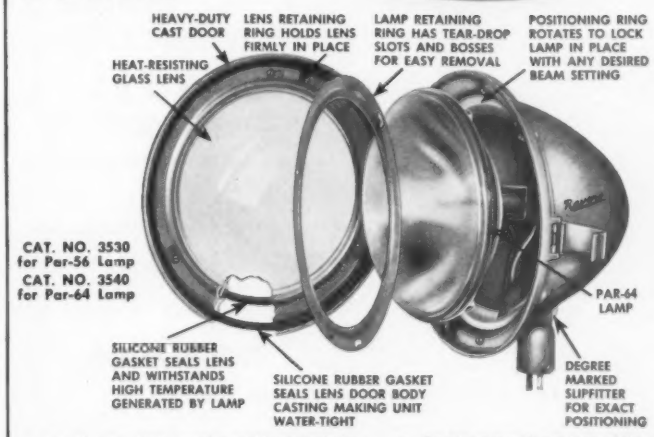




Fitter has 90° markings above and below horizontal. Covers full 180°.

. . . a great Revere Lamp Holder that offers great possibilities! Designed so that the lamp positioning rings and the retaining rings are interchangeable—thus accommodating a Par-56, 300 Watt, or a Par-64, 500 Watt Lamp of Narrow Spot, Medium Flood or Wide Flood Type. Not necessary to change the wiring.

Revere ELECTRIC MFG. CO. CHICAGO 40, ILL.
HEAVY DUTY CONVERTIBLE LAMP HOLDER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LENS RETAINING RING HOLDS LENS FIRMLY IN PLACE
LAMP RETAINING RING HAS TEAR-DROP SLOTS AND BOSSES FOR EASY REMOVAL
POSITIONING RING ROTATES TO LOCK LAMP IN PLACE WITH ANY DESIRED BEAM SETTING
HEAT-RESISTING GLASS LENS
CAT. NO. 3530 for Par-56 Lamp
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PAR-64 LAMP
SILICONE RUBBER GASKET SEALS LENS AND WITHSTANDS HIGH TEMPERATURE GENERATED BY LAMP
SILICONE RUBBER GASKET SEALS LENS DOOR BODY CASTING MAKING UNIT WATER-TIGHT
DEGREE MARKED SLIPFITTER FOR EXACT POSITIONING

1 A versatile unit readily adaptable to change in Beam Candlepower.

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4 Positioning Ring has slots to hold lamp in any position within circle.

5 Ring rotates and locks into place keeping lamp setting constant.

6 Lamp position stays put—unaffected during relamping or cleaning.

7 Housing precision-cast Aluminum Alloy. Strong, light in weight, dissipates heat faster.

This is a new addition to the extensive REVERE Line of Cluster-Lites and Fittings. With it you produce a workmanlike job that resists corrosion and retains its good looks for years. Write for data.

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January, 1957

Free bulletins

A new eight-page bulletin on **architectural floodlighting** is now available from the **General Electric Co.**, Schenectady 5, N. Y.

The publication, designated GEA-6437, illustrates various methods of floodlighting public and commercial buildings, fountains, industrial plants, motels, shopping centers, stores, banks, and other buildings. In addition, it provides information about some of General Electric's general-purpose and heavy-duty floodlights.

The bulletin also contains a section titled "Tips on Floodlighting Vertical Surfaces" and discusses the four "musts" found in an efficient, economical floodlighting installation. A table of recommended foot-candle levels for building exteriors is also included.

For additional data, ask for item B-130, using the coupon on page 12.

Schwager-Wood Corp., 8024 S. W. 35th Ave., Portland 19, Ore., manufacturer of high voltage electrical equipment, has released two brochures describing and illustrating their Type IV **vacuum interrupter switches** and Type 1C-2 **interrupting device.**

For additional data, ask for item B-131, using the coupon on page 12.

A new, four-page, illustrated booklet containing instructions and application information for the new **"Scotchcast" splicing kit** 90-B1 has been announced by **Minnesota Mining and Manufacturing Co.**, Dept. D6-157, 900 Fauquier St., St. Paul, Minn.

The new booklet describes the advantages of tailor-made "Y" splices which can be made in the field with ease, and features step-by-step instructions for using the kit. Also included is an explanation of how "Scotchcast" electrical insulating resin functions in poured splices and how the "Unipak" container is used.

For additional data, ask for item B-132, using the coupon on page 12.

The Kulka Electric Manufacturing Co., of Mount Vernon, N. Y. is at present distributing its new thirty-two page catalog covering its expanded line of **engineered electrical wiring devices.**

Among the hundreds of items shown, a large section is devoted to the fluorescent lampholders. Those features illustrated include the patented compression type lampholders for slim-line, cold cathode and rapid start lamps as well as lampholders for bi-pin lamps and four-foot slimlines and other general purpose types.

In the incandescent section there

are featured such products as the keyless fixture sockets, with a variety of hickeys, brackets, swivel sockets, adjustable sockets, spotlights, porcelain sockets, twin light sockets, duplex flush receptacles, waterproof sockets, and a line of standard and foreign plugs, caps, and adapters.

For additional data, ask for item B-133, using the coupon on page 12.

A revised catalog (27-620) that describes **industrial electrical heating units and devices** is available from the **Westinghouse Electric Corp.**, P. O. Box 2099, Pittsburgh 30, Pa. The catalog contains information and design selection charts on strip heaters, natural and forced convection air heaters, oven heaters, immersion heaters, cartridge heaters, melting pots, industrial hot plates, and heater control equipment. Information about selection of many special types is also included.

For additional data, ask for item B-134, using the coupon on page 12.

A completely new catalog (No. 526) of **power connectors and bus support clamps** is now available from **Southern States Equipment Corp.**, Hampton, Ga., superseding catalog No. 525-R. Furnished in a handsome 7-ring binder, the new catalog includes sections on bus support clamps, couplers and angle braces, bar connectors, Tee connectors, stud connectors, ground connectors, parallel clamps, and terminals.

Each section is provided with a pictorial index which permits the user to locate a particular type of connector or clamp quickly. The catalog pages contain detailed dimensional data and specifications.

For additional data, ask for item P-135, using the coupon on page 12.

A new, 12-page illustrated booklet, which interprets and clarifies new and revised requirements of the 1953 National Electrical Code that pertain to the **safe operation of portable tools and appliances,** has just been published by **The Arrow-Hart & Hegeman Electric Co.,** Hartford, Conn.

Entitled "For Safety . . . Important Facts You Should Know About Grounding Electricity," this booklet is designed to benefit users of portable tools and appliances in farms, homes and commercial and industrial establishments.

For additional data, ask for item B-136, using the coupon on page 12.

A new eight-page circular entitled **2200 3-in-1 Plugmold Electrified Baseboard** tells the complete story of the new idea in wiring and rewiring from **The Wiremold Co.,** Hartford 10, Conn.

Prepared for all Wiremold users, it illustrates and describes the advantages of 2200 Plugmold from the point of view of architects, builders, elec-

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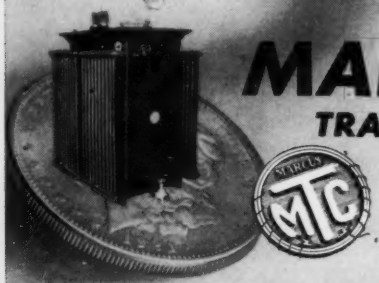

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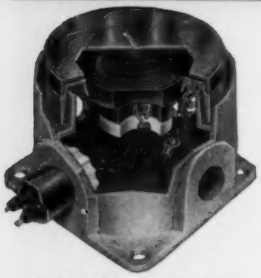

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All adjustable boxes are now equipped with a positive bond which makes them completely fire-proof.

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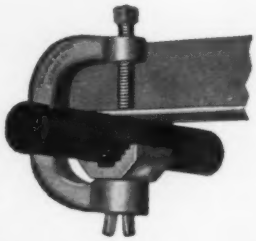
The most economical and best pipe hanger sold today — rust-proof.

For hanging pipe ½" to 1½" thick to steel beams ⅜" thick.



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trical contractors, etc., and shows its wide application in residential, commercial, and industrial buildings where multiple electrical outlets and additional circuits are needed.

There is a full listing of the fittings and Snapicoil for 2200, and a series of sketches shows how easily it can be installed by the electrician.

For additional data, ask for item B-137, using the coupon on page 12.

A new eight page 8-1/2 x 11 well illustrated two-color catalog (Bulletin 9819) describing the new 1 through 25 hp Type VS Class 2 **Gyrol fluid drives** is now available from **American Blower Corp.**, Detroit 32, Mich.

The new catalog discusses advantages and typical applications of the new adjustable speed fluid drives. A complete description of the operation of the new units is also given in the new catalog.

For additional data, ask for item B-138, using the coupon on page 12.

Bulletin Y, giving engineering and installation data on "Powerlite" **recessed fluorescent units**, has just been released by **Pittsburgh Reflector Co.**, 405 Oliver Building, Pittsburgh, 22, Pa.

The bulletin, describing the "Powerlite" KPL series, outlines the various components, including several new design features of the acoustical recessed units. The full sequence of installing the units in "Dry Type" hung ceilings with "Inverted T" support is given in detail. Installation suggestions are fully illustrated.

For additional data, ask for item B-139, using the coupon on page 12.

A 4-page, two-color catalog on the new Series 5700 **power derrick** has been published by **J. H. Holan Corp.**, 4100 West 150th St., Cleveland 11, Ohio.

The catalog contains capacities and dimensions, construction and operating features, and a photographic explanation of Holan's exclusive hydraulic sleeves for locking the side legs.

For additional data, ask for item B-140, using the coupon on page 12.

"How to bend **rigid or thinwall conduit** easily and accurately" is a new folder (No. 556) just published by **Gustave Lidseen, Inc.**, 1000 First St., Hayesville, N. C. It illustrates the complete line of Lidseen "Chicago" pipe benders featuring the exclusive calibrated degree scale vital for making accurate repeat bends with ease.

For additional data, ask for item B-141, using the coupon on page 12.

An all new twelve-page bulletin (CS-1000) containing engineering data, weights and dimensions on **load center transformers** has been released by **Kuhlman Electric Co.**, Advertising Dept., Bay City, Mich. The bulle-

tin covers construction features on liquid-filled and dry-type units for either indoor or outdoor installation with illustrations and drawings.

For additional data, ask for item B-142, using the coupon on page 12.

Wholesalers' place

(Continued from page 25)

tended, and collections made. We, as a manufacturer, could perform these additional essential functions and, if we did, we'd be entitled to the cost of them, plus a reasonable profit for the effort.

However, electrical wholesalers have readily available, in every trading area in the country, a competent inside and outside sales organization, warehouse space, intimate local credit and collection facilities—and most important, they spread the cost of these essential facilities over the sales of all of the lines of electrical goods they represent, so we do not bear this burden alone.

On any one day, in any one area, if we do no business at all, then we have no cost whatever, and no overhead. That's a pretty hard distribution setup to beat, and, very frankly, we haven't been able to beat it!

I'd like to add that, while the costs of distribution are very real, that they are not only wanted but demanded, by both producer and user, and that they must be paid for, it is still true that only the most economical—the cheapest—form of distribution can survive.

For instance, in my opinion, a producer cannot hope to perform his own local warehousing functions, and still expect to utilize that of the wholesale distributor. The buying public will pay the cost of distribution once, because they must have it, but they simply will not duplicate it by paying both the producer and wholesaler for the same function.

The days when "we'd walk a mile for a Camel" are past. Somebody has to have it for us, here and now. In our experience, that's the electrical wholesaler.

Business rise predicted

(Continued from page 22)

index to rise through the first half of next year, and then to level off. The median forecast for the index is 116 by the end of 1956, and 117 by the middle of 1957, with that figure remaining through the year. Again, there is a strong underlying feeling of inflation,

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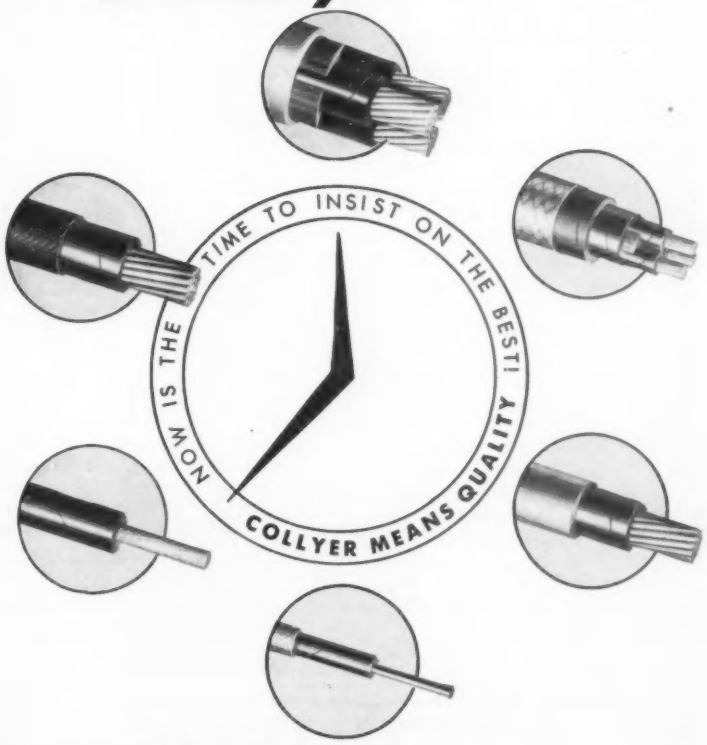

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Motor and Generator Leads
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Pole and Bracket Cables
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*Resistol is Collyer's Polyvinyl Thermoplastic Resin

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more pronounced than in last year's survey. Ninety percent of the economists think the index will rise, and fully a third expect that it will reach 118 or above by the end of 1957.

Average hourly wages

The economists were not asked for numerical forecasts on this subject, but were asked to state whether they thought the wage trend would be up, down or unchanged in durable and non-durable manufacturing and in building construction. The replies were overwhelmingly upward. For durable goods manufacturing, only five economists saw a downturn; ten felt there would be no change, and two hundred said the trend would be upward. The pattern for non-durables was almost the same, with 190 forecasting an upward movement, 22 foreseeing no change and three indicating a downturn. Only in building construction did a sizable number question whether there would be an increase, but even here a large majority predicted rising wages; the figures were 166 up, 42 no change, and 7 down.

While the economists expected a moderate increase in Gross National Product, they do not, on the average expect any significant increase in industrial output as measured by the Federal Reserve Board's index of industrial production. This is not at all paradoxical when it is remembered that the G.N.P. figure is in dollars, while the industrial production index is in terms of physical output. The economists, on the average, expect G.N.P. to rise about three percent; they expect the wholesale and consumer price indexes to rise almost as much. The conclusion would seem to be that they expect the rise in G.N.P. to be largely inflationary; and therefore, consistent with this, they see no particular increase in physical output of industry. The median forecast is that the index will be 145 at the end of this year, and also throughout next year.

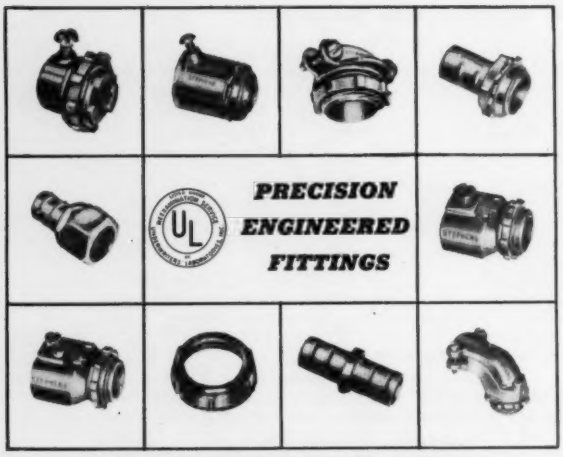
New plant expenditures

New plant and equipment expenditures in 1955 totalled about $29 billion, and the Department of Commerce estimates that business this year will invest a record-breaking total of about $35 billion. The economists in the survey are almost unanimous in expecting that 1957 will be another extremely high year for plant and equipment expenditures. Only five economists expect the 1957 figure to be as low even as last year's $29 billion; on the other hand, 149 economists expect that the 1957 total will be higher than this year's $35 billion. The average forecast is for plant and equipment expenditures of $37 billion next year, with about three quarters of the economists setting the figure in the range from $35 to $40 billion, inclusive.

Total new construction

Opinion among the economists is less unanimous on the construction outlook than it is on the other major indicators. The average forecast indicates a very slight rise in the value of construction put in place. During the first half of 1956 the annual rate was a little under $44 billion; the economists on the average expect it to go to $44 billion in the second half of this year, $44.5 billion in

M. STEPHENS MFG. INC.



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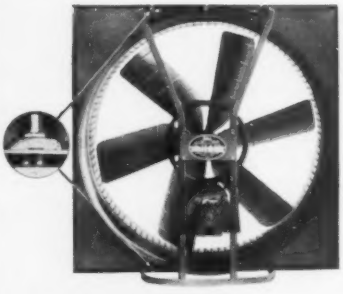

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Exclusive rubber vibration insulators, as shown in the insert photo, are built into the fan frame. You can meet specifications for resilient-mounted, wall-type fans with far less installation trouble and cost. No bother with mounting fan on rubber or felt.

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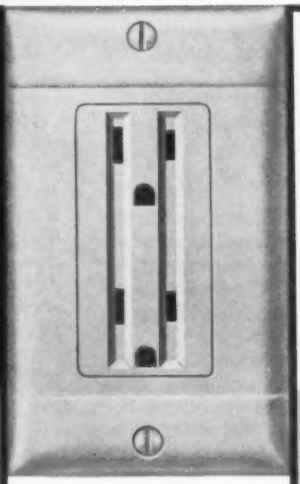

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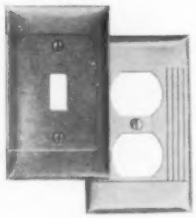

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All types – all combinations . . . any number of gangs. In heavy-duty Plastic, Brass or Stainless Steel.

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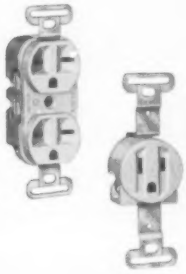

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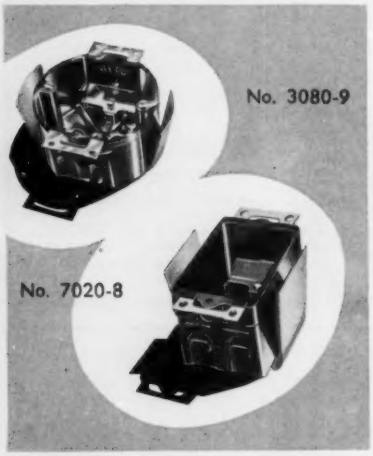

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PARKERSBURG, WEST VIRGINIA

the first half of 1957 and to $45 billion in the second half of 1957. The forecasts for the second half of 1957 tend to scatter widely, with substantial numbers at every level from $40 billion through $48 billion.*

New housing starts

The economists are somewhat more in agreement on the number of new non-farm housing starts to be expected next year. The total for 1956 will be very close to 1,100,000, and this is also the median forecast of the economists for both halves of next year. It is perhaps significant that few of the economists expect any sharp increase or decrease from this year's level; 75 percent place the annual rate during the second half of 1957 at 1,000,000 to 1,200,000.

Personal consumption expenditures

Personal consumption expenditures have been steadily increasing in recent years, and the economists in the survey are practically all of the opinion that this increase will continue next year, at least to a moderate degree. In the first half of 1956, the annual rate of personal consumption expenditures was a little under $263 billion. Nearly 90 percent of the economists expect that the 1957 rate will be higher than that. The median forecast for 1957 is $270 billion, and a third of the economists set the figure at $275 billion or higher.

***It should be kept in mind that this is the forecast of the economists polled by F. W. Dodge Corporation, and it is not to be confused with the construction forecast made by the Dodge organization itself.**

Radio-control system

(Continued from page 21)

Mr. Flournoy continued. "For example, our TV ad shows the following scenes: (1) one of our trucks answering a call; (2) our man entering the job; (3) our man working on the job. We shot this film at one-half speed and ran it at full speed! Naturally, the action is fast—our man appears to trot into the job—and the announcer says, 'See, this fast service!' It's humorous and very effective.

"Our system operates on one assigned frequency—30.58 megacycles—and has a range of 30 miles. Our trucks operate on this frequency, and, of course, each driver hears all transmissions. Thus, they can arrange rendevous to exchange equipment, materials, or tools without returning to the shop.

"This brings up an important point. We cut hours off our service operation by thoroughly equipping each truck so that the driver may stay gone all day. We start at eight o'clock and usually wind-up around four in the afternoon. We advertise 24-hour service and subscribe to an evening telephone answering service for night calls. Our drivers take their trucks home and are paid time and a half for any evening or night work.

"We have not had to increase our costs to pay for radio control. If business was tight, we could lower our charges in order to gain the competitive edge.

"We were granted our license in May, 1955. It took us two months through July to get the units installed and in use. Only a year later the system had already paid for itself.

"Our customers don't gripe about our charges, because they are as good or better than other service firms. We have found our customers prefer paying for quick service when they need it—and our radio control system gives us the fastest service in this growing city."

Fixture installations

(Continued from page 23)

entire system is in its predetermined place.

This, Mr. Somes said, eliminates repeated relocation of installation platforms and other equipment. It allows both the busway and fixtures to be installed before permanent flooring is laid or machinery put in place, and avoids interference with other plant construction activities.

The special roller hangers and other equipment used in connection with the Somes method are available through normal General Electric distribution channels.

Where do you stand?

(Continued from page 24)

the line with all the other ingredients that go into making a sound partnership. The individual distributor should be able to see—in writing—the policy of every firm he does business with. "When you put a policy in writing," one dis-

tributor told me, "you've got to live by it to keep it from being simply a piece of paper."

Sad experience

Earlier this year I attended a meeting where I heard a wholesaler relate what a sad experience he had had. It seems someone offered him a tremendous buy in a certain item. It wasn't until he started trying to sell it that he discovered that the code had limited its use. It was this distributor's fault because he should have known what the limitations of the product were and should have known the code requirements. But was he the only one to blame? How about the man who sold it to him — he knew!

Cheap distribution makes "deal" men out of salesmen. If all the salesmen in this industry have to operate as wheelers and dealers they soon become poor salesmen. Poor salesmen result in poor buying habits for a firm. Poor buying leads to poor quality. Poor quality often leads firms down the road to irresponsibility in the marketplace.

There is no place in this electrical industry for irresponsibility. There is too much at stake. For the past few years, both business leaders and economists have reached for the superlatives in discussing the growth of this industry and of its future prosperity. Right now the industry is spending some 10 million dollars to perpetuate that growth. We can't sit around idly while all this growth is going on about us. We have to do our share.

The industry's emphasized interest in the contractor and distributor today suggests that it has recognized the vital part both must play in building a greater electrical life for America. That recognition would be intensified if both did not confuse the picture by indicating so little understanding and recognition of their own respective responsibilities in the electrical trade channel.

I think the time has come when we must stop stumbling over each other and learn to work together for the good of the industry. It seems that too many of us — in every branch of this industry — are concentrating too much time, thought, and energy on the negative or critical approach to our problems. Let's stop fighting the problems and, instead, take steps to correct them.

If we are to have that healthier industry, that financially attractive industry, we have to start with the individual. Let's test it.

Contractors' problems

Contractors today are concerned with a number of problems — interference of contractor-customer relations by distributors; the execution of takeoffs by wholesalers; the extension of credit to firms that are considered unqualified and undeserving; the stretching of price quotations; bid peddling; bid shopping; using one firm's confidential figures as information to bargain with others.

These are all real problems to contractors. But do you notice anything unusual about them? They are not problems caused by major changes in economic trends or basic functional changes in the development of an industry.

They are all problems created by and maintained because of the weakness of individual operators of businesses. And they'll be solved only when there is developed more integrity, more sense of responsibility and just plain good intelli-

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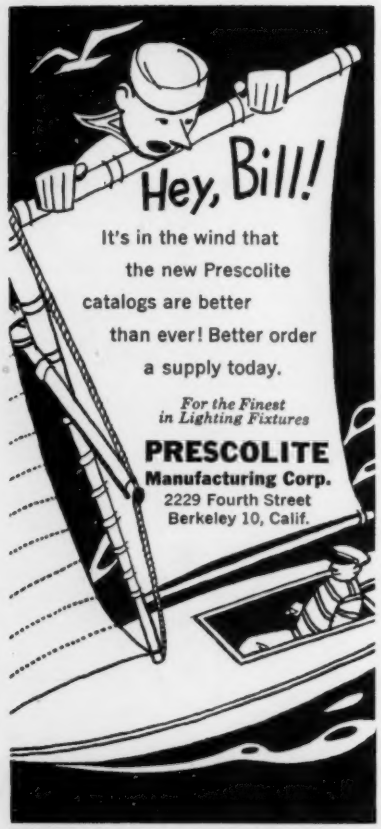

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gent business sense among all businessmen in this industry; when there is developed in this business the courage to establish and maintain a set of principles which will guide our every individual business transaction. And, as a further solution, when a businessman is courageous enough to point with pride to this set of rules to any and all who may inquire as to where he stands.

If you have any doubts as to the practicability of this honor system among businessmen, let me say that, in just two cases where it has been tried, there is a very positive customer and trade reaction to it.

Two case histories

A distributor in the East took the "secrecy" out of his company policy by publicizing it to his customers and the trade in one-two-three fashion. He left nothing to the imagination. "Our policy is a good policy and anything good can stand repetition once in a while," he said. It is reported that customer reaction to this distributor move was swift and favorable. It was summed up in the words of one of them: ". . . We wish more suppliers would come up with a similar statement — and live up to it."

A major manufacturer of electrical equipment has published a brochure outlining what his policy is regarding the distribution of his products. "In any partnership," he asserts, "each partner assumes certain obligations and becomes responsible for certain functions of the business." The brochure then goes on to classify what the manufacturer is expected to do and what is expected of the distributor in that selling partnership.

I think we will not have to worry too much about being faced with the high cost of cheap distribution, — with its resulting loss of product and service to the American public, if all of us in the industry — wholesalers, manufacturers, agents, contractors — all of us will only determine what we stand for. A firm policy, backed up with management that has courage and a positive attitude, can work wonders in the electrical industry today.

I believe that the same courage and common sense that has built this great electrical industry to its present heights will, if revived, leave no ceiling on how far the industry can advance. It will insure full employment for those dependent on it for their livelihood, as well as insure a profitable return for those investing in it.

Where do you stand? What's your policy? What are your goals? These are questions you should be asking of yourself as well as of others.

Made-to-order service

(Continued from page 27)

poses, Consolidated at last has been able to design a plant specifically for their own and the contractors' special needs. The building is of medium size — 4,000 sq.ft. on one level with 20-ft ceilings for high stacking of stock and for storing pipe on end.

The whole plant is designed for *centralized* management and operation by a minimum staff without sacrificing quality of service. The manager, or assistant in charge, sitting in a central office at one end of the counter can survey through three special windows all interior areas; so that he can direct his efforts or those of clerks to customers at the counter or in the fixture room, or toward the staff unloading trucks or assembling orders in the shipping and loading zone. When none of these areas requires attention, he can be pricing tickets or planning sales calls and still know what's going on all over the plant. This set-up enables fewer men to do the work without any risk of neglecting a customer.

In keeping with the central operation, the building has a wide central drive-in both for loading and unloading — with the special display room for fixtures on one side of the drive-in, and the shipping space adjacent to rows of supply bins on the other side.

Alongside the drive-in, between this and the fixture room, is the attractive and efficient 20-ft city-counter installation, with ample shelves behind it and small bins underneath. Above the counter, the entire 30x12-ft wall is used for the effective display of dozens of modern devices and specialized items, about which the busy contractor needs to be reminded. These are things which he normally would not think about when he rushes in for a pick-up order. The factory-built display boards are hung on a pegboard background, so that they can easily be changed as required. The whole building is lighted by plastic skylights in the roof, and artificial

lighting is seldom needed.

Fixture display room

The handsome fixture display room has a separate outside entrance, so that home owners or architects who come in to consult on fixtures for or with their contractors do not have to pass through the drive-in or supply space — they enjoy complete privacy while making their selection. This jobber makes a special point of not cluttering up the fixture room with floor displays of fans or hoods — the latter are in the city counter space instead. Also they do not sell fixtures to builders or owners but only to legitimate identified contractors — and this goes for other electrical supplies as well.

In the stock room, the fixtures are marked with the firm's own private numbers in continuous sequence from 1 to 450 and are placed in the same sequence on the inventory shelves. This saves hours of time, and a skilled order clerk can assemble the fixtures for a whole house in 15 to 20 minutes.

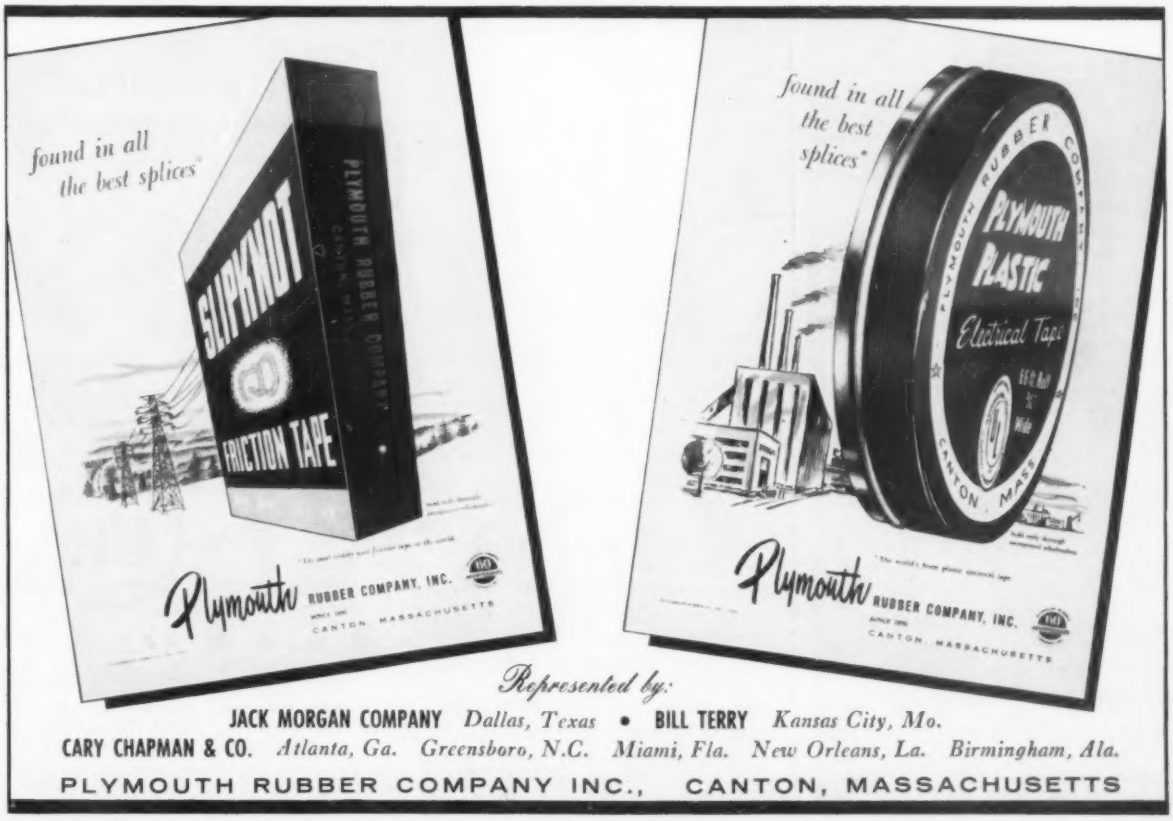
The modern counter area is an asset to the appearance of the store. It offers efficient personal service on fast-moving items to those who want it, and helps new accounts get acquainted. The arrangement of stock is such that over half of the pick-up orders can be filled without moving from that one spot. However, it accounts for only 5 per cent of the gross sales of the branch, for contractors soon find that the rush early-morning deliveries are more convenient. The staff believes that they can put up a $2,000 order out back in about as much time as a $20 list over the counter, item by item. So again the delivery system proves more efficient all around. For the same reason, they don't need any long loading platforms, though there is plenty of parking space for everything.

The stock room is well organized, with all allied items kept close together, with wide uncluttered aisles permitting the use of rolling grocery baskets for rapid assembling of orders, and with all heavy supplies like conduit arranged near the doors and drive-in. The company policy of broadening stocks to include *all* the items that contractors ask for in each area is another way of gaining new business and affording one-stop convenience. The number of accounts in the old branches have about doubled in the past year.

Central planning

Consolidated finds many advantages in central planning for the four branches, especially because they are all in a direct line on the main highway along the coast. This permits central purchasing of complete trailerloads of material from factories, with the individual quotas being dropped off at each branch en route. The result is better service from suppliers at favorable prices with some saving on transportation. About 60 per cent of the total buying for the group is done from Miami, though local managers can order whatever they need without red tape. Eventually it is planned to set up minimum and maximum inventory figures *per item* and order most everything from Miami to relieve local managers as much as possible of inventory control.

Though each branch has surveyed the special needs of its area and does as much of its own warehousing as possible, they all do in emergencies "switch" supplies



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from one plant to another. This affords a greater than normal reserve of inventory, and automatic teletype systems maintain close contact between branches. The wide distribution of the plants enables the firm to cover a large number of accounts with faster service, and to exploit the hot spots of building expansion.

A combination of periodic direct mail, promotional envelope stuffers and personal sales calls, acquaints contractors in all areas with the special delivery service and other facilities of the jobber.

The company has been able to get able managers for their branches from their own ranks by a consistent policy of selecting and training all employees from the beginners up. When the stock boys and truck drivers are first hired, they are told, "You can go just as far up the ladder in this outfit as you are able." They are soon given a chance to work on the overtime delivery system; and by this means, after they learn the lines, they can boost their pay considerably above the average.

They continue to learn from supervisors and factory representatives and literature; and when a new branch is opened, a couple of the top-level order clerks are transferred to the new plant to train the local boys in fast delivery. Some of the managers own stock in the firm and all of them receive incentive pay based on the gross sales of their plants. At whatever level a job opening occurs, it is filled from the ranks, which helps maintain morale and group effort at a consistent peak.

Consolidated naturally supplies contractor customers with any information they want on special problems or new materials, though they find this is a minor need. On the other hand, when the boys get "softened up" by growing to depend on the special-delivery service, they admit they just can't get along without it.

The company has a considered policy on sound credit and believes that — for the benefit of the industry and in fairness to their other customers — they should not plan to give any extra long-term accommodations to anyone. They feel strict terms help keep the industry strong.

The firm serves the power company in Key West, industrial companies, the city, the county, the airlines in Miami, and the U.S. Airforce from West Palm Beach

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and Melbourne. But their main interest is in contractor business, and this is in every area handled in a separate department which is hand tailored to serve them. The staff makes a point of promoting all new devices for doing quicker and better jobs, and follows up special orders to the factories to make sure they are expedited.

However, when their whole operation is surveyed, they claim that the quickest route to a contractor's heart is still through the immediate delivery of material he needs either right now or the first thing tomorrow morning in order to go ahead with his installation. And they warn: "Don't start this overtime speed-up system unless you're prepared to be run ragged with work!"

Backwoods location

(Continued from page 29)

"This didn't work out too well," said Berg," since once they received the check, they might never come near our place. Now that they must spend it for merchandise in our store, they invariably come around, and that gives us a chance to get acquainted."

Such new sales often add $500 a month from each credit grantee.

Another reason for Berg's mushrooming business and popularity with contractors is that when his extensive fixture display attracts "drop-in" do-it-yourself customers who want to look around at the various fixtures for items they're considering in the home they're building by themselves, Berg invariably asks for the name of their electrical contractor.

"If they ask about price," we refer them to the installed price which must be figured by a contractor. After all, a fixture is no good without adequate and code installation, and we can usually reason with them and get them to see a contractor."

Berg confers with his customers along the lines that it just isn't good business simply to give an estimate on the bare bones of a fixture installation. When it comes to selling women customers especially, Berg feels that the contractor can get a bigger job, and do a better one, by stressing that fixture design can change a room's undesirable proportions or give it atmosphere, two cardinal considerations when dealing with the distaff side.

And that in the case of a store, emphasis should be placed on the fact that an adequate lighting fixture installation is a powerful selling tool.

Said Berg: "Selling lighting fixtures is like a two-way street, with red and green light signals. You can't crash through without considering the matter of comparative prices with in-town stores, along with similar variety.

"Then you need to stop, listen and let the customer think. You need to anticipate the red light of objection, wait for the green-go of approval, then step on it!"

Texas conference

(Continued from page 58)

surface of adjacent cables with the soil well packed between them to prevent faults from communicating from one cable to another and to provide the best condition for heat transfer away from the cable.

"Before backfilling, an addition-

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Nalcobrite Lamps . . . tungsten filament adds sparkle to crystal and polished fixtures. Clear or frosted. Candelabra, intermediate, standard bases.
Nalco Candlbeme Lamps . . . radiate without diffusion. Give sharp, brilliant reflection from polished surfaces.
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al layer of three to four inches of sandy loam is desirable. If the sandy loam contains relatively large stones or pebbles it should be screened before using under or over the cable. The sandy loam, which contains both sand and loam, provides protection from possible injury from the crushing effect of stones or rocks which sometimes occurs as the backfill settles. In addition, soil of this type tends to hold moisture and provide better heat transfer away from the cable than with sand alone or with clay alone. Sand dries out quickly as it permits water to drain off readily and clay bakes out in dry seasons and in this condition it has high thermal resistance. When the cables are installed they should be laid into the trench and not pulled in, as in the case of duct installation.

"Although the trench method of installation, as described, may cost more initially than "plowed in" cables, this incremental cost could easily represent the difference between a trouble free system and one that is in frequent trouble. It should be recognized at the start that the initial cost of a direct burial system is essentially higher than for an equivalent overhead system. If low cost is taken as the primary objective in selecting the installation procedures for a direct burial system, the maintenance costs are likely to suffer and poor service reliability result."

Trends in underground

The concluding speaker of the conference was J. C. Smith, of Commonwealth Edison Co., Chicago, who presented a most detailed account of "Practices and trends in serving underground residential customers."

Mr. Smith's conclusions on the subject were:

"Underground residential distribution costs vary from about 1.5 to as much as 10 times those of an overhead system required to serve the same area. This variation is dependent upon the practices of the individual utility with regard to overhead standards as well as the underground design standards acceptable in the particular locality.

"By the utilization of available components and simplified installation practices, as well as a realistic appraisal of acceptable service and operating standards and requirements, underground 4 kv residential distribution can be provided in most localities at costs in the range of 2 to 2.5 times that required for an equivalent overhead supply.

"With the ever increasing demand for an increased utilization of electric service, coupled with the public demand for service improvements and improved appearance of utility service facilities, future use of underground distribution in residential areas will undoubtedly increase substantially.

"We should be ever alert to this demand and strive, through the development of improved equipment and installation practices, to make such service available at minimum cost."

Code comment

(Continued from page 3

They are taking advantage of the same provisions in the Code.

M. M. Brandon: I would like to clear up one thing. The 5-foot tap has nothing to do with the situation at all. You can have a tap, as Mr. Whitner pointed out, to an outlet. It is limited to a certain length, I think 12 inches, 18 inches. It has nothing to do with the 5-foot tap.

Underwriters Laboratories, in testing the inside of equipment, does not refer to the Code, because you never would get anywhere if you did. The Code is not intended to apply to the inside of equipment.

That is made, we take all sorts of wires inside of appliances on the basis that you test them for that specific use, and if they are suitable, we take them, if they are unsuitable, we don't.

As I pointed out to so many of these groups in times past, if you tried to apply the Code, the limit of #14 wire that you have in Article 300, you'd have a motor that would be so costly you couldn't use it. You don't expect that.

The Code doesn't apply to that, so when we take smaller conductors, speaking now as an Underwriters representative, in ranges, it has nothing to do with the 5-foot rule. It is taken because it is suitable for that particular service on the basis of test.

Frank Camus: Mr. Brandon, if that is true, and I am sure you are right, something should be done with the last part of 2434c.

(In view of the fact that a panel subcommittee is working on this problem, the chairman proceeded to the next question.)

Question: "May busways be connected in multiple?"

E. C. Soares: I'd like to say one thing on that, Frank. I'd like to say it isn't good engineering. Probably someone might find out in the Code, or I might find it myself in a few moments, as to whether it is permitted or not, but I do not consider it good practice.

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The question has been brought up that 3105 permits it, but 3105 distinctly says, it refers to conductors in a specific sized range of #1/0 to 500,000 cm, and certainly you cannot by any means construe that to apply to busways.

Another question is the question of paralleling of conductors to provide a circuit in a busway. That is a different thing from what you are talking about, the paralleling of two separate busways. The question of paralleling of conductors in each phase is an entirely different thing.

I have been looking at the Code. I find no place where it is permitted, although I know of a case or two where it has been done. It has been done, however, by bringing them off as a phase, split into two pieces, fused separately, and then from that separate fusing they go to these busways.

Now personally, I don't think it is good practice but I have seen it done in that way. But I think if we want to get at the meat of this discussion, the thing is to keep the points we are discussing clear as separate and distinct. The point is can we parallel two separate bus ducts—the paralleling of feeders within the bus duct is a different thing.

Kent Stiner: We find nothing in the Code that permits it or prohibits it. In other words, the Code doesn't state either way. It is being done quite regularly in some locations, and in some locations it is necessary especially where we get up to around six or eight thousand amperes. So I think the answer to the question is, the Code does not cover it.

Frank Camus: In other words, the Code does not prohibit it. Does the panel agree with Mr. Stiner's analysis of the question? . . .

We have already expressed the opinion there should be provisions and rules in the Code, because that type of installation is certainly coming up.

Mr. Smith, we are talking about whether or not the Code permits busways in multiple, and as I understand the problem, it would be two separate or three separate busways, separate enclosures similar to separate runs of rigid conduit. Does the Code permit it?

International Secretary Smith: So long as I have understood the intent of the Code, busways are no different than insulated conductors, and I suspect that if you have an installation of parallel busways or buses, let's say, in an enclosure, and each enclosure includes all of the phases in such metal enclosure, it would be permissible. That is my understanding.

Secretary Miller: Mr. Chairman, I have it as a matter of record. Could we have some clarification of that particular Article in respect to using them in parallel?

Frank Camus: Mr. Smith, don't you think the Article Mr. Soares read should be reworded a little bit and stay away from the circular-mils of conductors?

Secretary Smith: For your information, Section 3105 has been revised. Now, there is no limit on the upper limit in the 1956 Code for paralleling conductors. There is a lower limit which is equivalent to 2/0 conductors, but insofar as the upper limit is concerned, that's been eliminated.

(This discussion of the Code will be continued in the February issue.)

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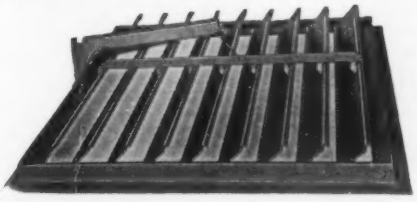

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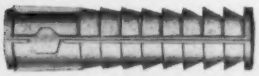

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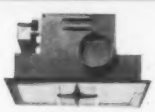

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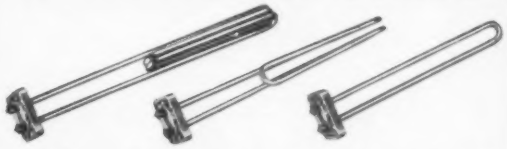
NOW—You Can Replace Heating Elements For All Sizes — All Makes of Domestic Hot Water Tanks With

VULCAN ELECTRIC IMMERSION UNITS



Eliminate replacement problems with Vulcan's *complete line* of electric immersion elements for domestic hot water storage tanks. Seven different header styles include six flange types and one series with screw bushing type headers. Type DSF, illustrated, is one of the flange-type series.

Vulcan Electric Immersion Elements have extra heavy forged brass flange and tubular copper sheath. "Powerbond" attachment of heater to flange is tested under 350 lbs. hydrostatic pressure. Vulcan elements meet all requirements of Underwriters' Laboratory. Send for free 8 x 10 inch counter card.

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Cartridge • Strip • Tubular • Immersion Electric Heaters
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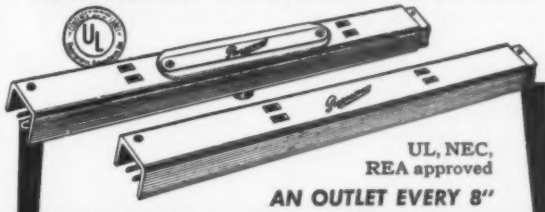
New from Massey **Pierceway**
TRADE MARK REG. U.S. PAT OFF.

MOULDING TYPE
MULTIPLE ELECTRIC OUTLETS



UL, NEC, REA approved

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Uses Unlimited: Screw onto any surface, anywhere!

Profitable: Attractively display packaged. Over 70 supplement parts for a variety of combinations.

Send for Prices, Catalogs, Information

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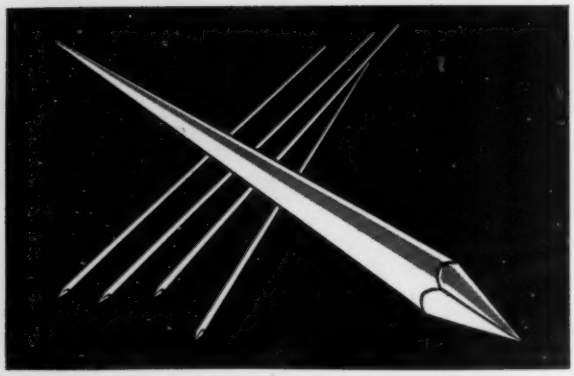

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DOUBLE FEATURE!

Order FORDMAC *hot dip galvanized ground rods and pipe hanger strip now.*

HOT DIP GALVANIZED GROUND RODS, Regular Stock Sizes: 1/2" x 6', 1/2" x 8', 5/8" x 6', 5/8" x 8', 3/4" x 6', 3/4" x 8'. Special sizes and lengths available on request. All Ground Rods are Hot Dip Galvanized after cutting and pointing for positive protection against rust and corrosion.

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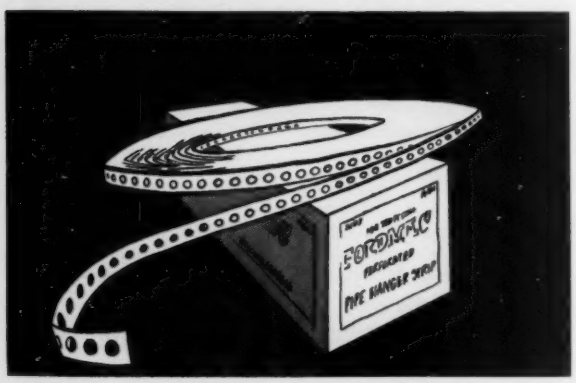
Wholesalers—write today for complete information.

Ford McCleskey Mfg. Co.

POWERS FERRY ROAD ROUTE 3
MARIETTA, GEORGIA



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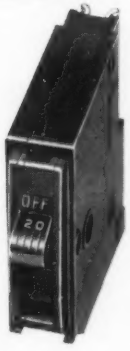
Something NEW Has Been Added To—

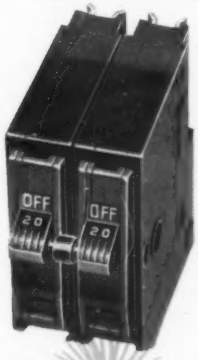
QO—FINEST BREAKER EVER BUILT!

1-POLE



15-50 Amps

2-POLE



15-70 Amps

3-POLE

15-50 Amps

ONE, TWO and THREE POLES GO ANYWHERE—UNLIMITED!

Square D's NEW 3-pole QO crashes the 3-phase price barrier!

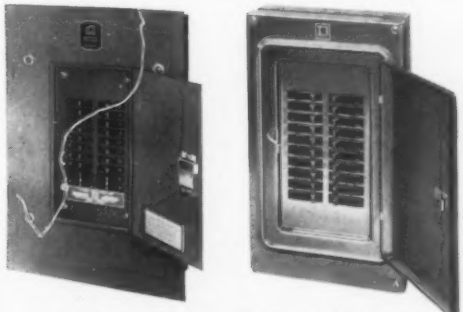
Square D's 2-pole QO Now extended to 70 Amperes for heavier loads!

QO FEATURES

- One size per pole. No space penalty
- Plug-in mounting. No time-wasting screws
- Silver-plated connections equal to best bolted design
- Switches like a "T" rated switch
- Temperature-corrected. No nuisance tripping
- Meets Federal Spec WP-131A—Class A
- Box lugs on line, load and neutral
- Rejection "ears" prevent overprotecting mistakes
- **NO CALL BACKS**

Write for QO Bulletin. Address Square D Company, 6060 Rivard Street, Detroit 11, Michigan.

SAME BREAKER...PANELBOARDS & LOADCENTERS



1 Phase—3 Wire—Distributed Phase
3 Phase—4 Wire—Distributed Phase
2 THROUGH 42 CIRCUITS

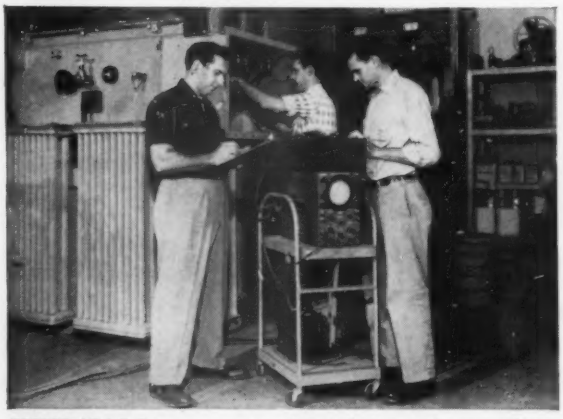
NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

SECONDARY UNIT SUBSTATIONS

ENGINEERED AT I-T-E and coordinated to meet the operating conditions found in your plant.

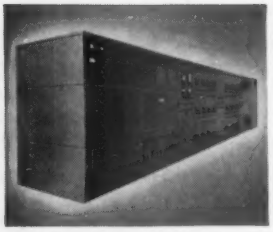
BUILT AT I-T-E with such extra features as circuit breaker test-position with doors closed.



TESTED AT I-T-E to assure ease of installation, and top performance under operating conditions.

SHIPPED FROM I-T-E to assure prompt delivery of one complete "package," ready to install.

I-T-E MAKES IT EASY TO BUY COMPLETELY COORDINATED UNITS



Only I-T-E builds transformers and switchgear in the same plant. This permits them to assume all responsibility for your unit substation requirements. Close association of engineering and production relieves you of detailed planning, paperwork, and the problems of coordinating deliveries. Shipment is from one location. Installation is speeded. Substation components are completely integrated to provide top performance at low overall cost.

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